FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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TO OUR READERS.

The Supply of "FLIGHT." Important Notice.

Order "FLIGHT" to be either delivered or reserved for you regularly.

As the demand for "FLIGHT" is so great each week, it is of the utmost importance that readers should place their orders *firmly* for copies of "FLIGHT" at the bookstalls, their newsagents, or direct from the publishers, at 44, St. Martin's Lane, W.C., if they wish to secure a copy every week and avoid disappointment. The stringent Government restrictions in regard to the supply of printing paper necessitates this precaution in order that only actual numbers required are printed, and all wastage by unsold copies may thereby be reduced to a minimum, if not eliminated.

THE PUBLISHERS.

EDITORIAL COMMENT.

NOT only has the war greatly affected the work done at that great asset of the Empire, the National Physical Laboratory at Teddington, but a very great amount of the work carried out has been, as we have in the past had occasion to point out, of such a nature that publication of the results obtained would be unwise at the present moment. This applies to aeronautics as well as, if not more than, to other branches of research. It must not, however, be concluded that the absence of published detail reports indicates that there is a lessening in the amount of research work done. On the contrary, the last two years have seen a very marked increase in the number of experiments, so much so, in fact, that from the very much curtailed annual volume just issued for 1915–16 we find it has been found necessary to construct two new air channels, one of 4 ft. and one of 7 ft. diameter. These are now almost completed and new buildings have been provided for the accommodation of the greatly increased staff. The equipment of the laboratory now consists of two 7 ft. channels, two 4 ft., and one 3 ft. channel, a whirling arm of 60 ft. diameter for testing propellers, and a small water channel for photographic records of the flow of fluids.

The N.P.L. Report for the Year 1915–16.

Little may be said of the *results* of the various experiments carried out, but a brief reference to the *nature* of the experiments is permissible. In continuation of earlier experiments a number of different wing sections have been tested with a view to finding one which will give a good speed range while having a reasonably high lift coefficient. The experiments on the effects of biplane spacings have been continued with more modern wing sections than those employed in the earlier tests, a very important question, since the amount, if not the character, of interference between the two wings of a biplane will vary according to the section employed.

The special types of machines evolved in order to meet the requirements of actual war service have rendered a study of the various bodies employed very important, and a series of experiments have been carried out, presumably with a view to determining the resistance and stability of bodies of different types with their complement of guns, &c. Other experiments have been made on the combination of body, tail plane and elevator, fins and rudder, an item of the greatest import-

ance from the point of view of stability, since the shape and proportions of an aeroplane body must necessarily have their effect on the flow of air round the control organs of the machine, and the scientific design of tail planes has in the past been restricted by lack of sufficient data to such rule-of-thumb methods as making the tail about twice the size it would be required to be if working in undisturbed air. Not only will the effectiveness of the tail planes be influenced by the flow of air round the type of body employed, but also by the fact that they are working in the slip stream of the propeller when the engine is running, and in addition the air passing around the control surfaces has been disturbed by the main planes.

The latter brings up the question of mutual interference of the various components of an aeroplane, and this has been dealt with in a series of experiments on models of complete aeroplanes, directed mainly to the investigation of the stability and controllability of aeroplanes in flight. In addition to the experimental investigation into the stability of aeroplanes the mathematical analysis of the disturbed rectilinear motion has been extended. Not only so, but the analysis of the disturbed motion in curvilinear flight, although not yet completed, has been commenced and has given some interesting results.

The study of and experiments on propellers has been continued, the chief innovation to be recorded in this connection being a successful attempt to transfer some of the test work from the whirling arm to the wind channels where the work of investigation is much simpler and considerably more accurate. Among the experiments thus transferred to the wind channel may be mentioned that of determining the interference between the propeller and body of an aeroplane.

Among the special investigations one of the most connected series, and certainly a very important one, which is, as a matter of fact, still in progress, relates to the efficiency of radiators for aeroplanes from the point of view of the relation of resistance to rate of cooling. The urgent necessity of investigation in this direction was pointed out in "FLIGHT" many months ago, and its importance is increasing daily with tendency towards the more general employment of larger, water-cooled engines.

While thus a great deal has been accomplished in the investigation of aeroplanes and all appertaining to them, it must not be thought that the problems relating to lighter-than-air craft have been neglected. Experiments on airship models have been carried out, chiefly with a view to the determination of the effect of the fin area on the restoring couples that follow a displacement. The mathematical analysis of the stability of airships is being proceeded with contemporaneously with the experimental investigations, and follows along the lines adopted in the case of the aeroplane.

From the fact that it is stated that there has been a very marked decrease in the number of models of mercantile ships tested, while at the same time an appreciable increase has been made in the staff engaged on experiments in the Froude tank, it may perhaps be permissible to conclude that much of the work carried out for the Admiralty in the tank has been in the nature of investigations relating to seaplanes and seaplane floats. This work has necessarily been of a very confidential nature, but it may be taken for granted that it has been of the very greatest importance.

In addition to what might be termed the purely aerodynamical portion of the researches, some interesting tests belonging to the mechanical constructional side of aircraft work have been carried out. Among these mention may be made of some fatigue tests on timber for aeroplane construction, and on wires subjected to vibration. Tests of various metals have also had attention, and this subject will, it is hoped, be dealt with more fully during the coming year. Of more particular interest to those whose flying has to be done over water are the tests which have been carried out with Kapok and other life-saving floats; the greatest difficulty with Kapok is to get a really watertight cover.

From the foregoing very brief *résumé* of the activities of the Laboratory, it must not be taken that the entire efforts of the staff are directed to aeronautical research. As a fact, this side of scientific investigation occupies but a small portion of the time of the Teddington institution, to the director of which the country owes a very great debt of obligation. A satisfactory feature of the "carrying on" of the Laboratory in these days of stress is to be noted in the number of voluntary assistants who have given their services and the co-operation of 47 women who have filled positions usually allotted to men.

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The New Song of Hate of the Zepp.

Almost as if by way of a commentary on the concluding remarks of our leader the week before last on Aircraft Insurance, the very venomous "appeal" for funds by the German Air League came somewhat appropriately to point our suggestion of possible Zeppelin aggression presently, in gratification of the Huns' now intensified hatred of everything British, and especially of their powerlessness to overcome our advantageous insular position.

What sort of "public" is it that is gulled and bled of its subscriptions by such balderdash as the following:—

"When the column of fire springs upwards to the night sky from the burning streets of London, the metropolis of the world, then new knowledge gleams from the flames. When the squadrons of bold airmen carry across the North Sea mischief to England, then the new song of the new war resounds from their heroic deeds."

Yet it is this sort of stuff that is issued above the signatures of such men as Dr. Paasche, Vice-President of the Reichstag, and Herr E. Humperdinck, the composer. Nothing could better demonstrate the straits to which the Germanic race have been reduced by this mistaken war than an outbreak of this character. It suggests, nevertheless, the direction in which these hogs' minds are running, and our countering organisation should be on the alert to see that the marauders do not snatch a chance of obtaining partial success, owing to any momentary want of watchfulness upon our part. The recently reported activity of the Zepps. on the Danish coast and elsewhere carries little significance in this connection. These aircraft are more concerned in anxiously watching for possible moves on our part, by our fleet and otherwise, to have much time to spare at present for hazardous trips to this country. The time *will* come, however, when we may once more be deemed worthy of attention, and it is that contingency against which we have to guard. Although there are already a matter of 1,884,000 insurance policies taken out under the National Aircraft Scheme, there are still plenty well within the zone range of these raiders. We have often heard that to be insured is a long way towards avoiding anything happening. So to the uninsured we would suggest that they should "think it over."

The British Air Services

"PER ARDUA AD ASTRA"

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, *it is not repeated in this column.*

Royal Naval Air Service.

THE following appeared among the Admiralty announcements of July 12th :—

Temporary Sub-Lieut. (R.N.V.R.) N. W. Frames, entered as Probationary Flight Sub-Lieutenant (temporary) seniority of July 12th, and appointed to "President," additional.

Probationary Flight Sub-Lieutenant G. N. Lindeman (temporary commission as Sub-Lieutenant (R.N.V.R.), re-issued with original seniority of April 5th, 1915, and appointed to "President," for R.N.A.S.

The following appeared among the Admiralty announcements of the 13th inst. :—

C. Hanson-Abbott, entered as Probationary Flight Sub-Lieut. (temporary), seniority July 2nd, and appointed to "President," for R.N.A.S. The undermentioned have been entered as Probationary Flight Sub-Lieutenants (temporary), seniority of July 16th, and appointed to "President," additional to R.N.A.S. ; C. R. Rischbieth, F. S. G. Lewis, P. G. Williams, A. B. Holcroft, H. W. Kendall, E. B. Drake, H. W. T. Chalcraft, A L. Taylor, L. V. Kahn, E. J. K. Buckley, F. I. Jacks, J. C. Arnold, F. J. Hosking, H. E. Winter, O. B. Ellis, L. E. Pulford, and Lord Ossulton.

The following appeared among the Admiralty announcements of July 15th :—

The following temporary commissions (R.N.V.R.) have been granted ; Lieut. S. R. Mullard. Sub-Lieuts. J. E. Burgess and L. N. Robinson, all seniority July 14th, and all appointed to "President," additional for R.N.A.S.

The following appeared among the Admiralty announcements of July 17th :—

Mr. G. F. Creaghan, entered as Probationary Flight Sub-Lieutenant (temporary), seniority July 23rd, and appointed to "President," additional for R.N.A.S.

Royal Flying Corps (Military Wing).

THE following appeared in the *London Gazette* of July 11th :—

Attached to Headquarter Units.

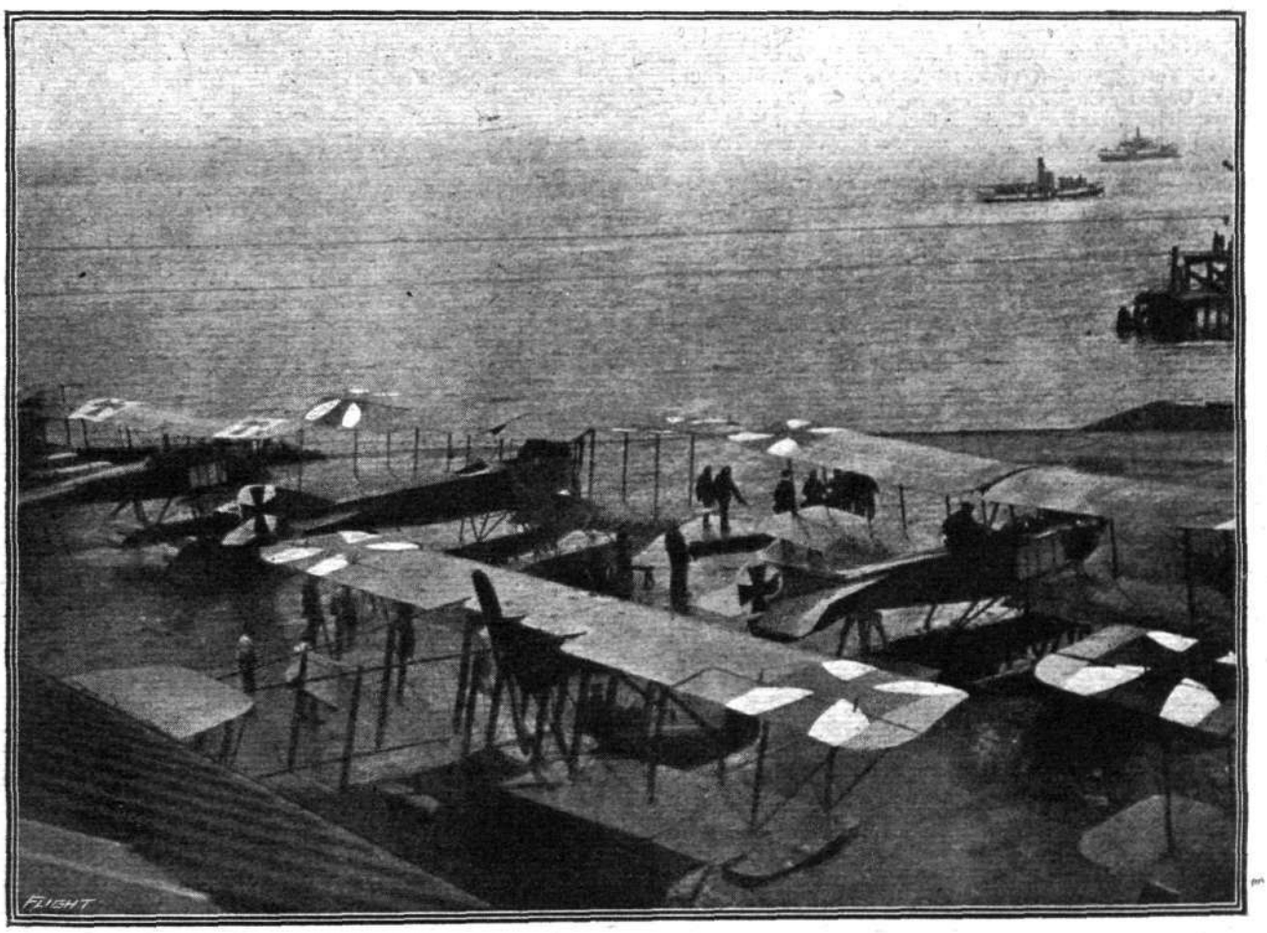
Brigade-Commander.—Bt. Lieut.-Col. W. G. H. Salmond, R.A., from a Wing Comdr. R.F.C., and to be Temporary Brig.-General whilst so employed ; July 1st, 1916.

Brigade-Major.—Major D. L. Brereton, Durh. L.I. ; June 30th, 1916.

Establishments.

Flight-Commanders (from Balloon Officers).—Temporary Capts. J. O. Davis and Hon. A. S. Byng, General List ; May 17th, 1916. Capt. G. Disney, Essex R. ; June 1st, 1916. Capt. L. S. B. Hull, R. W. Surr. R. (T.F.) ; June 3rd, 1916. Capt. F. X. Russell, R. Muns. Fus. ; June 12th, 1916. Temporary Lieut. A. C. B. Geddes, General List, and to be Temporary Captain whilst so employed ; June 26th, 1916. Bt. Major A. J. Ross, R.E., from a Flying Officer ; June 22nd, 1916. Lieut. H. O'N. de H. Segrave, R. War. R., from a Flying Officer and to be Temporary Capt. whilst so employed ; May 29th, 1916. Lieut. R. G. H. Murray, 9th Gurkha Rif., Indian Army, from a Flying Officer, and to be Temporary Capt. whilst so employed ; June 21st, 1916.

Flying Officers.—Temporary Second Lieut. H. S. Paynter, E. Surr. R., and to be transferred to the General List ; Second Lieut. R. H. Wallace, Montgomeryshire Yeo. (T.F.) ; Second Lieut. E. D. Hicks, 11th (Res.) Canadian Inf. Bn. ; Second Lieuts.



A BATCH OF GERMAN SEAPLANES AT AN AIR STATION ON THE NORTH SEA COAST.—
In the foreground will be seen a bat boat of the Sopwith type.

C. H. Howell, H. H. Turk, and F. McD. C. Turner, Special Reserve; Second Lieut. (on probation) J. I. Mackay, W. Rid. R. (Special Reserve), and to be seconded; Second Lieuts. B. H. Hunt, T. Macleod, and C. Kerr, Special Reserve; Temporary Second Lieut. O. E. Simmonds, General List; Second Lieut. G. V. Almer, Special Reserve (since deceased); June 17th, 1916. Second Lieut. C. S. Hollinghurst, Special Reserve; June 21st, 1916. Capt. E. D. Drew, R. W. Surr. R., and to be seconded; Capt. G. G. Adeley, R. Ir. Rif., and to be seconded; Lieut. E. D. Dent, R. Dub. Fus. (Special Reserve), and to be seconded; Lieut. H. A. Fordham, North'd Fus., and to be seconded; Second Lieut. (temporary Lieut.) A. E. Davis, Suff. R. (T.F.); Temporary Second Lieut. P. D. Stuart, L'pool R., and to be transferred to the General List; Temporary Second Lieut. C. C. Brill, attd. E. Surr. R., and to be transferred to the General List; Second Lieut. H. C. Lovely, Bedf. R. (Special Reserve), and to be seconded; Second Lieut. A. G. Taylor, Montgomeryshire Yeo. (T.F.); Temporary Second Lieut. P. G. Horswell, R. Lanc. R., and to be transferred to the General List; Second Lieut. F. O. Cave, Rif. Brig., and to be seconded; Second Lieut. L. M. McCoy, Special Reserve; Second Lieut. (on probation) C. D. Kershaw, W. Rid. R. (Special Reserve), and to be seconded; Second Lieuts. R. A. Delhaye and A. H. Vinson, Special Reserve; Second Lieut. H. G. White, E. Kent R., and to be seconded; Second Lieut. H. R. Harker, Special Reserve; Temporary Second Lieut. G. M. Clarke, Leins. R.; June 22nd, 1916; Temporary Second Lieut. J. H. Norton, 7th Res. Regt. of Cav., and to be transferred to the General List; Temporary Second Lieut. B. W. Blayney, North'd Fus., and to be transferred to the General List; June 23rd, 1916.

Balloon Officers.—Second Lieut. J. E. S. P. Bradford, W. Rid. R., and to be seconded; June 22nd, 1916. Second Lieut. (Temporary Capt.) the Hon. E. G. W. T. Knollys, Lond. R. (T.F.); June 26th, 1916.

Assistant Equipment Officer.—Temporary Second Lieut. H. Cumming, Midd'x R., and to be transferred to the General List; June 25th, 1916.

Memoranda.—To be Temporary Second Lieutenants for duty with the R.F.C.; July 8th, 1916: Lce. Corpl. Henry Kirton, from R.E.; Driver Frederick G. Litchfield, from H.A.C. (T.F.); Pte. Coryndon S. Edwards, from Inns of Court O.T.C.; Cadet Charles S. Hall, from Durham Univ., O.T.C.

Supplementary to Regular Corps.—Second Lieutenants (on probation) confirmed in their rank: W. L. Scandrett, C. H. Howell, F. McD. C. Turner, H. H. Turk, R. A. Delhaye, B. H. Hunt, T. Macleod, C. Kerr, C. M. Denny, L. R. Wright, A. H. Vinson, J. C. Forsyth, H. R. Harker, C. S. Hollinghurst, W. M. Cumming, F. M. Iredale, F. B. Burton, I. N. Dracopoli, G. Purvis Russell-Balfour-Kinnear.

To be Second Lieutenants (on probation): Alfred E. Fincher-Brookes; June 8th, 1916. Francis C. Young; June 17th, 1916.

The following appeared in a supplement to the *London Gazette* issued on July 12th:—

Flying Officers.—Lieut. (Temporary Capt.) G. L. Hunting, North'd Fus. (T.F.); May 6th, 1916. Temporary Second Lieut. A. A. N. Pentland, General List; May 27th, 1916. Temporary Second Lieut. H. K. Gibson, North'd Fus., and to be transferred to the General List; May 29th, 1916. Second Lieut. A. Cropper, Wilts R., and to be seconded; May 30th, 1916. Second Lieut. W. A. McCloughry, 9th Australian Light Horse; June 21st, 1916. Temporary Lieut. The Hon. E. F. P. Lubbock, A.S.C., and to be transferred to the General List; June 22nd, 1916. Second Lieut. J. P. Porter, Special Reserve; June 23rd, 1916. June 24th, 1916: Capt. A. J. M. Pemberton, Leins. R., and to be seconded; Temporary Lieut. J. T. Milne, General List, from a Flying Officer (Observer); Lieut. A. G. Henshaw, Canadian General List; Temporary Second Lieut. J. W. Lawlor, A.S.C., and to be transferred to the General List: Temporary Second Lieut. T. W. L. Saunt, R.A., and to be transferred to the General List; Second Lieut. C. Gordon-Davis, N. Staff. R., and to be seconded. June 26th, 1916: Lieut. G. Wadden, R. I. Fus., and to be seconded; Second Lieut. H. C. Davis, R. Berks R., Special Reserve, and to be seconded; Second Lieut. (on probation) H. MacKenzie, R. Lanc. R., Special Reserve, and to be seconded; Second Lieut. J. W. Lockhart, Special Reserve. Second Lieut. C. T. Daily, Special Reserve; June, 1916.

Assistant Equipment Officers.—June 22nd, 1916: Second Lieuts. J. C. Forsyth and F. B. Burton, Special Reserve. Temporary Lieut. G. E. Giles, A.S.C., and to be transferred to the General List; June 29th, 1916.

Memoranda.—Brevet Lieut.-Col. E. M. Maitland, Essex R., to be Temporary Colonel whilst Commandant of a R.N. Air Station; July 13th, 1916.

To be Temporary Second Lieutenants for duty with the R.F.C.; July 8th, 1916: Lance-Corpl. William S. Philcox, from Dulwich Coll. O.T.C.; Pioneer Philip Wake, from R.E.; Pte. John H. Cooper, from Hamps. R., Special Reserve; Pte. Talbot B. Bruce, from Tonbridge Sch. O.T.C.; Pte. Alfred J. Gogarty, from Cam'n Highrs., Special Reserve; Cadet Lieut. Edward O. L. Bell, from Marlborough Coll. O.T.C. From Inns of Court O.T.C.: Ptes. Mervyn J. Sonnenberg, John H. O. Jones, Francis C. Lamb and Bernard Elliott.

Supplementary to Regular Corps.—Second Lieutenants (on probation) confirmed in their rank: C. T. Lally, J. P. Porter, J. W. Lockhart and H. G. H. MacSwiney.

Thomas Morrison to be Second Lieutenant (on probation); May 21st, 1916.

The following appeared in a supplement to the *London Gazette* issued on July 13th:—

Park-Commanders.—Maj. A. D Carden, R.E., from a Squadron-Commander; May 10th, 1916. Temporary Capt. T. E. St. C. Daniell, General List, from an Equipment Officer and to be Temporary Major whilst so employed; June 7th, 1916.

Flying Officer.—The appointment of Temporary Second Lieut. S. O. Barnsdale, General List, is antedated to May 24th, 1916.

Flying Officer (Observer).—Temporary Second Lieut. W. H. Peirce, R.A., and to be transferred to the General List; June 1st, 1916.

Assistant Equipment Officers.—Second Lieut. C. M. Denny, Special Reserve; April 3rd, 1916. Second Lieut. L. R. Wright, Special Reserve; April 4, 1916. Lieut. (Temporary Capt.) J. B. Bowen, Pembroke Yeo. (T.F.): April 20th, 1916. May 4th, 1916; Temporary Second Lieut. R. J. Everest, General List; Temporary Second Lieut. A. J. O. Spiers, General List; Temporary Second Lieut. J. A. Pritchard, General List; May 14th, 1916. Second Lieut. (Temporary Lieut.) Sir J. W. B. Simeon, Bt., Hamps. R. (T.F.); June 7th, 1916. June 24th, 1916: Second Lieut. W. M. Cumming, Special Reserve; Temporary Second Lieut. A. W. Empson, General List; Second Lieut. F. M. Iredale, Special Reserve; Second Lieut. I. N. Dracopoli, Special Reserve.

Supplementary to Regular Corps.—Thomas Goulbourn to be Second Lieutenant; June 8th, 1916.

The following appeared in the *London Gazette* of July 14th:—

Attached to Headquarter Units.

Staff Captain.—June 7th, 1916; Capt. H. N. Walker, Welsh R., from a Wing-Adjutant, R.F.C., vice Temporary Lieut. N. C. F. Francis, Lond. Brig., R.F.A. (T.F.).

Establishments.

Flight-Commander.—Temporary Lieut. R. H. Peck, from a Flying Officer and to be Temporary Capt. whilst so employed: June 29th, 1916.

Flying Officers.—Temporary Capt. B. T. Monier-Williams, from an Assistant Equipment Officer; June 5th, 1916.

Flying Officers (Observers).—Temporary Capt. F. P. Don, Sco. Horse Yeo. (T.F.); June 16th, 1916. June 28th, 1916: Temporary Second Lieut. J. A. R. Buller, 12th K.R. Rif. C., and to be transferred to the General List; Temporary Second Lieut. G. B. Crole, R.A., and to be transferred to the General List; Temporary Second Lieut. R. Bell Irving, R.E.; Lieut. D. Carruthers, Canadian A.S.C.; Second Lieut. W. O. P. Winmill, Bedf. R., and to be seconded; Second Lieut. B. K. B. Barber, North'd Fus., and to be seconded; Temporary Second Lieut. C. Arkle, General List. June 29th, 1916: Temporary Lieut. A. T. A. Nesbitt, Conn. Rang., and to be transferred to the General List; Lieut. J. M. Tyrrell, R. Ir. Fus., Special Reserve, and to be seconded. July 1st, 1916: Lieut. G. W. Devenish, R.A., and to be seconded: Lieut. K. Mackenzie, Sea. Highrs., Special Reserve, and to be seconded; Temporary Second Lieut. R. V. Kann, R. Sc. Fus., and to be transferred to the General List; Temporary Second Lieut. G. C. Twining, General List.

The following appeared in a supplement to the *London Gazette* issued on July 16th:—

Wing-Commander.—Capt. (Temporary Major) P. B. Joubert de la Ferte, R.A., and to be Temporary Lt.-Col. whilst so employed; July 1st, 1916.

Squadron-Commanders, from Flight-Commanders.—Major J. G. Weir, High. Brig., R.F.A. (T.F.); June 22nd, 1916. And to be Temporary Majors whilst so employed.—Lieut. (Temporary Capt.) E. J. Bannatyne, 19th Hrs.; July 1st, 1916. Capt. T. A. E. Cairnes, 7th D.G.; July 2nd, 1916. Capt. R. R. Smith-Barry, Special Reserve, July 3rd, 1916.

Assistant Equipment Officer.—Second Lieut. H. G. H. MacSwiney, Special Reserve; May 18th, 1916.

Memoranda.—N.C.Os. to be Temporary Second Lieutenants (on probation) for duty with the R.F.C.: 2nd Class Air-Mechanic Fritz Bowyer, from R.F.C.; June 17th, 1916. Sergt. Reginald W. Settle, from A.S.C.; June 21st, 1916. Sergt. Percy Francis, from Sea. Highrs. (T.F.); June 22nd, 1916. 1st Class Air-Mechanic Thomas V. Brake, from R.F.C.; June 23rd, 1916. 2nd Class Air-Mechanic John R. Evans, from R.F.C.; June 25th, 1916.

Supplementary to Regular Corps.—To be Second Lieuts. (on probation): Walter B. Kellogg; June 10th, 1916. June 19th, 1916: Gastrill B. Wilkins, Erle F. B. Curtiss, William E. Bousfield, Maurice Myers, John Y. de la C. Elliott, and Herbert Weakley; June 19th, 1916. Stanley Clark; June 28th, 1916. Maurice A. Benjamin, Austin E. Neal, Douglas Welch, Frank S. Smith, Hon. Charles E. St. G. Caulfield, Joseph W. Gardner, Forrest G. Parsons, Arthur B. Drewery, Raymond Baltus, William L. Alison, Patrick S. Leigh, Herbert D. Pashley, Maurice R. Helliwell, Charles H. Bell, James Mitchell, Lewis Sloden, William D. Thom, Gordon T. Pettigrew, James Gardner, Frederick A. D. Grace, Mervyn C. Mossop, Philip M. Haarer, Charles A. M. Furlonger, Thomas A. J. Guyatt, John J. Dunne, Russell G. Robson, Harold E. Ward, Ronald E. Littell, Gerald H. Foley, John Doxey-Parkinson, George V. Cottam, Clement A. Pike, Leonard M. Barlow, Edwin A. Mearns, and William B. Melville; July 8th, 1916.

The following appeared in a supplement to the *London Gazette* issued on July 17th:—

Assistant Equipment Officers.—Second Lieut. G. F. Randall, Hamps. R. (T.F.); July 2nd, 1916. July 4th, 1916: Second Lieut. H. D'O. Beningfield, Special Reserve; Second Lieut. A. L. Jurd, Special Reserve.

Memoranda.—To be Temporary Second Lieuts. for service in R.F.C.: July 8th, 1916: Pte. Francis Bissicks, from Inns of Court O.T.C.; Pte. William Henry Irvine, from R. Fus.

Supplementary to Regular Corps.—Second Lieuts. (on probation) confirmed in their rank: P. Pralle, G. A. Lascelles, H.D'O. Beningfield, A. L. Jurd, and G. P. Alexander.

To be Second Lieuts. (on probation): Ernest A. Salt; July 1st, 1916. Philip L. Wood, Rodney Stubbs, James Rimmer, Herbert Simson, and Basil H. Godfrey; July 8th, 1916.

MENTIONED IN DESPATCHES.

IN a supplement to the *London Gazette*, published on July 13th, is given a despatch from General Sir Charles Monro giving the names of officers and men mentioned for distinguished and gallant services during the period of his command of the Mediterranean Expeditionary Force. Among them are:—

Royal Naval Air Service.—Commander C. R. Samson, D.S.O., R.N., Wing-Commander, R.N.A.S.; Lieutenant-Colonel E. L. Gerrard, R.M.L.I., Wing-Commander, R.N.A.S.; Lieutenant R. B. Davies, V.C., D.S.O., R.N., Wing-Commander, R.N.A.S.; Captain H. Fawcett, R.M.L.I., Acting Wing Commander, R.N.A.S.; Flight-Lieutenant G. L. Thomson, D.S.C., R.N.A.S.; Flight-Commander H. Stanley Adams, R.N.A.S.; Midshipman E. K. H. St. Aubyn, D.S.C., R.N.; Second Lieutenant W. B. Jones, R.M.; Flight-Lieutenant E. A. O. Auldjo-Jamieson, R.N.A.S.; Carpenter J. J. Brownridge, R.N., Warrant Officer, First Grade, R.N.A.S.

In the same supplement is a list of officers and men brought to notice by Maj.-Gen. C. V. F. Townshend, C.B., D.S.O., in connection with operations under his command in Mesopotamia. Among them appear:—

Royal Naval Air Service.—Flight-Lieutenant V. G. Blackburn, D.S.C.; Flight-Lieutenant A. K. Robertson; Mr. G. D. Nelson, Warrant Officer, 2nd Grade.

Royal Flying Corps.—Second Lieutenant E. J. Fulton, 1st Duke of York's Own Lancers (Skinner's Horse); Captain S. C. B. Mundey, Oxf. and Bucks. L.I.; Captain H. Petre, Commonwealth Mil. Forces; Captain T. W. White, Commonwealth Mil. Forces.

With reference to the list of officers and men mentioned in despatches, which appeared on page 541 of "FLIGHT" for June 29th, an official correction has been issued to the effect that the name of Flight Sub-Lieutenant Isaac Henry Woolf Barrato, R.N.A.S., should be substituted for the name Flight Sub-Lieutenant Isaac Henry Woolf, R.N.A.S.

THE ROLL OF HONOUR.

THE Secretary of the Admiralty announces the following casualties:—

Killed (*July 10th*).

Flight Sub-Lieutenant Victor Nicholson, R.N.
Probationary Midshipman Bernard W. Davy, R.N.R.

Accidentally Killed (*July 14th*).

Probationary Flight Sub-Lieutenant Edmund A. Freeman, R.N.

Injured (*July 9th*).

Probationary Flight Sub-Lieutenant Paul O. Gadbois, R.N.

The following casualties have been officially announced by the War Office:—

Killed.

Captain G. A. Burney, Yeomanry and R.F.C.
Second Lieutenant A. G. T. Cruickshank, R.G.A., attached R.F.C.
Second Lieutenant J. W. Halcrow, Dorset Regt., attached R.F.C.
Second Lieutenant R. Sherwell, Lincoln Regt., attached R.F.C.

Previously reported Missing, believed Killed, now reported Killed.

Lieutenant J. R. Dennistoun, Canadian Div. Cyclist Co., attached R.F.C.

Died of Wounds.

Second Lieutenant C. T. H. Vaisey, Royal Flying Corps.

Died.

4231 Corporal J. Smith, Royal Flying Corps.

Wounded.

Second Lieutenant P. R. Meredith, Royal Flying Corps.
Second Lieutenant H. S. Paynter, E. Surrey Regt., attached R.F.C.
Second Lieutenant J. H. Ross, Royal Flying Corps.
Lieutenant H. O'N. de H. Seagrove, R. Warwick Regt., attached R.F.C.
Lieutenant W. Stobart, Durham L.I., attached R.F.C.
Second Lieutenant T. A. Tillard, Yeomanry, attached R.F.C.
2592 Sergeant H. N. Johnson, Royal Flying Corps.

Missing.

Second Lieutenant W. F. L. Castle, Royal Flying Corps.
Second Lieutenant S. H. Ellis, Royal Flying Corps.
Second Lieutenant W. B. Ellis, A.S.C., attached R.F.C.
Lieutenant D. H. Gray, Royal Flying Corps.
Second Lieutenant N. P. Tucker, Indian Army Reserve of Officers, attached R.F.C.
Major F. F. Waldron, Hussars, attached R.F.C.

Believed to have been Taken Prisoner at Kut-el-Amara.

Second Lieutenant C. H. Courthope-Munroe, Indian Army, Reserve of Officers, attached R.F.C.

Previously Officially reported Missing, now Unofficially reported Prisoners of War.

10805 2nd Class Air-Mechanic E. R. Coleman, Royal Flying Corps.
4995 1st Class Air-Mechanic P. Shaw, Royal Flying Corps.

The following officers have been reported by the Base as believed to have been taken prisoners at Kut-el-Amara. Official lists have not yet been received from the Turkish Government:—

Captain R. D. de la C. Corbett, Indian Infantry, attached R.F.C.
Captain S. C. B. Mundey, Oxford and Bucks. L.I., attached R.F.C.
Captain T. R. Wells, Indian Infantry, attached R.F.C.

Fatal Accidents.

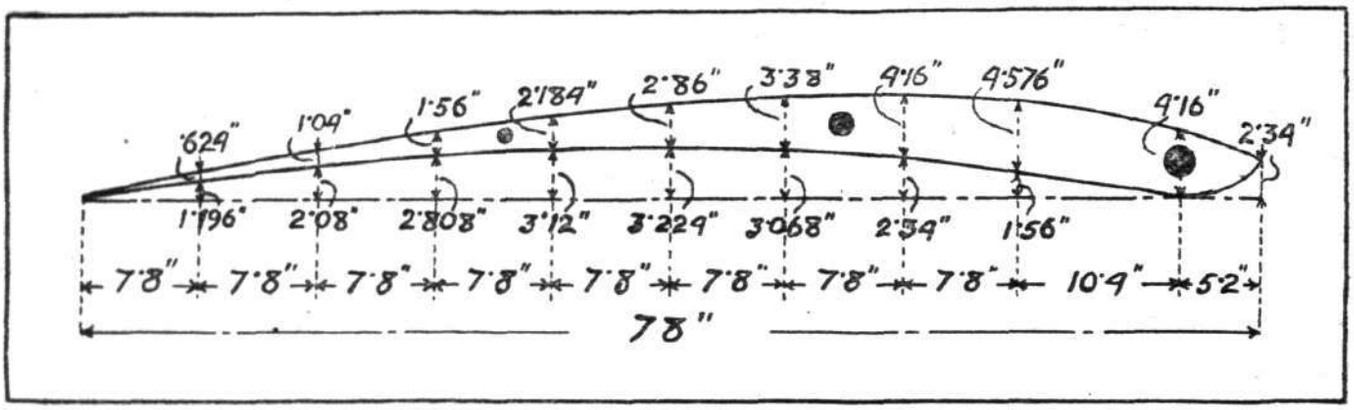
A FATAL accident occurred at Farnborough on Monday evening. A machine piloted by Sec. Lieut. W. B. Power, R.F.C., was seen to side-slip, and nose-dive to the ground, the pilot being instantly killed.

While flying over the Hounslow district soon after 6 p.m. on Tuesday evening, an aeroplane suddenly crashed to the ground in the cemetery. The wreck immediately burst into flames, and the pilot and observer were burnt to death.

THE C.E. TRANSCONTINENTAL TRIPLANE.

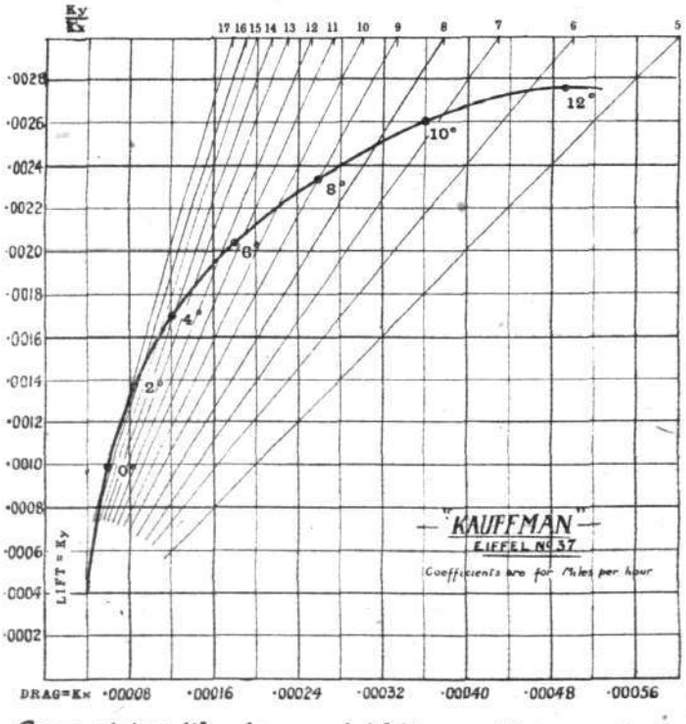
WITH the coming of the large-sized aeroplane the question of multiplanes at once suggests itself as being a means of overcoming many of the problems involved. Apart from the obvious advantages as regards construction and weight-saving this arrangement of lifting surfaces offers, there is, we believe, much to be gained aerodynamically. Since the early, and by no means unsuccessful, efforts of A. V. Roe, little has been done in the way of triplanes, or machines having a greater number of lifting surfaces, and it is only recently that designers appear to be turning their attention in this direction. An interesting example of one of these efforts is to be found in the large C.E. Transcontinental triplane built at Anderson, Ind., U.S.A., some particulars of which have appeared in our American contemporary, *Aerial Age*. Although this machine is essentially a large one, having over 1,000 sq. ft. of lifting surface, it will be seen from the accompanying scale drawings that by virtue of the arrangement of the planes the overall dimensions are by no means abnormal, the length being 32 ft. 6 ins., and the span 59 ft. It has been designed for use over both land and water, a four-wheeled running gear being fitted to the boat-like body. The latter consists of a rectangular *fuselage* constructed of ash and spruce longitudinals and struts, which tapers to a horizontal knife-edge at the rear and to a point at the front. The whole body is strongly wire braced, and is given a streamline shape by means of formers and stringers, and a covering of three-ply spruce and a single layer of specially treated cloth. Provision is made for eight passengers, who are totally enclosed by the body, vision being obtained by means of windows.

The most interesting feature in the design of this machine, however, is to be found in the main planes. It will be noticed that the gap is exceptionally small in comparison with the chord—far too small, we should say, to get the best results from the planes. The wing-section employed is that of Kauffman (Eiffel No. 37), which compares favourably with the best wing-sections of to-day. It is doubtful, however, if the designers of the C.E. triplane have taken full advantage of its characteristics, for apart from the question of the small gap previously referred to, the normal angle of incidence given (8°) does not appear to be the best under the circumstances. A section of the wing used on the C.E. triplane with dimensions is shown in one of the accompanying illustrations, whilst the general characteristics of a similar model section tested at the Eiffel Laboratory are also given. The planes are built up on two main tubular steel spars with ¾ spruce battens nailed and glued to hollow laminated birch and mahogany webs. Some 2 ft. 4 ins. from the trailing edge is a third spar. The interplane struts are arranged in sets of three—a strut from each spar—in all, eight sets or 24 struts between each plane. In the centre the top and middle planes are supported by two sets of struts each, the lower ones being mounted on the body, to which the lower plane is attached direct. Level with the middle plane, one on either side of the body, are the two engines, 8-cylinder 140 h.p.

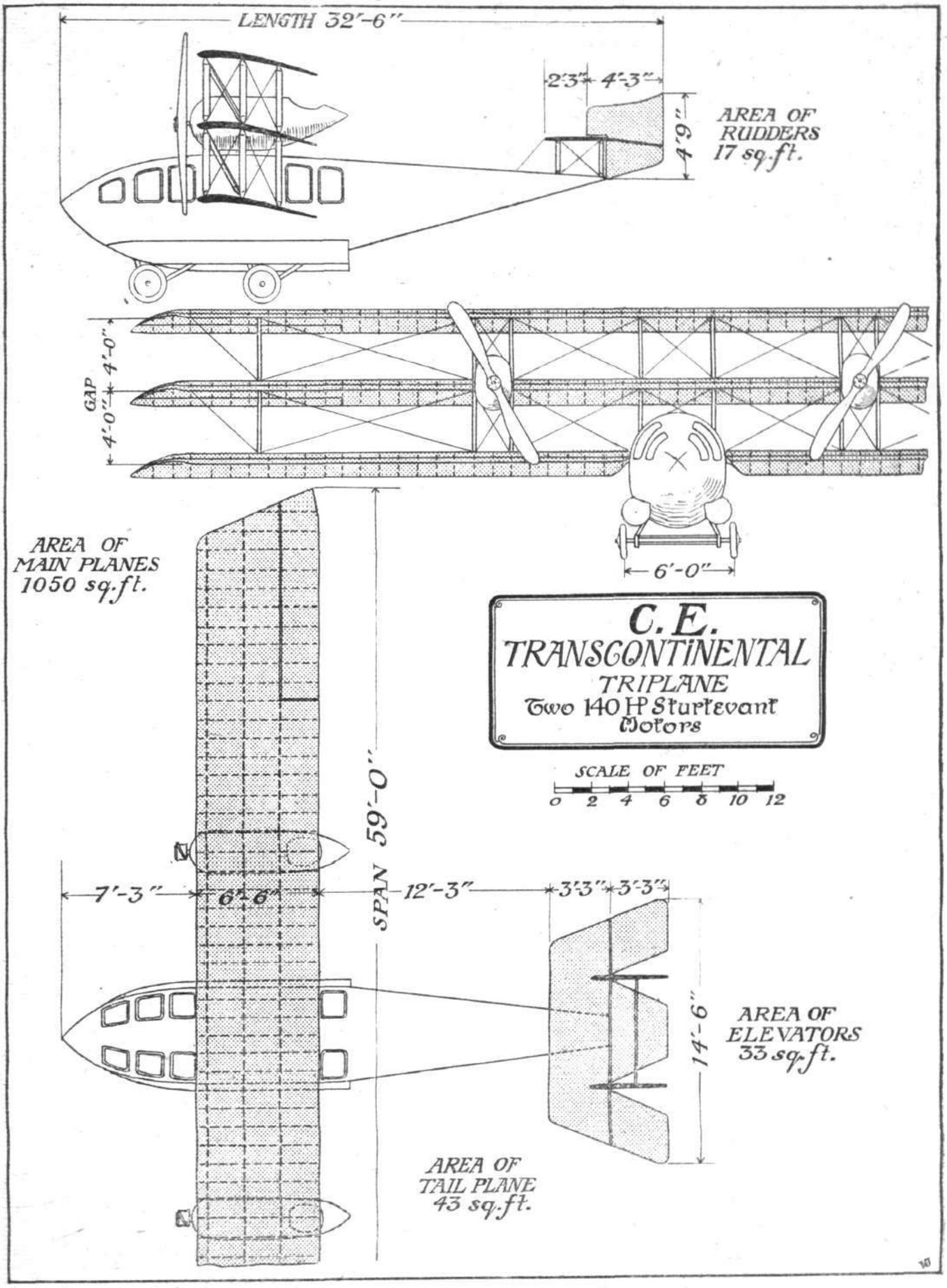


A section of one of the wings (Kauffman) used in the C.E. Transcontinental triplane.

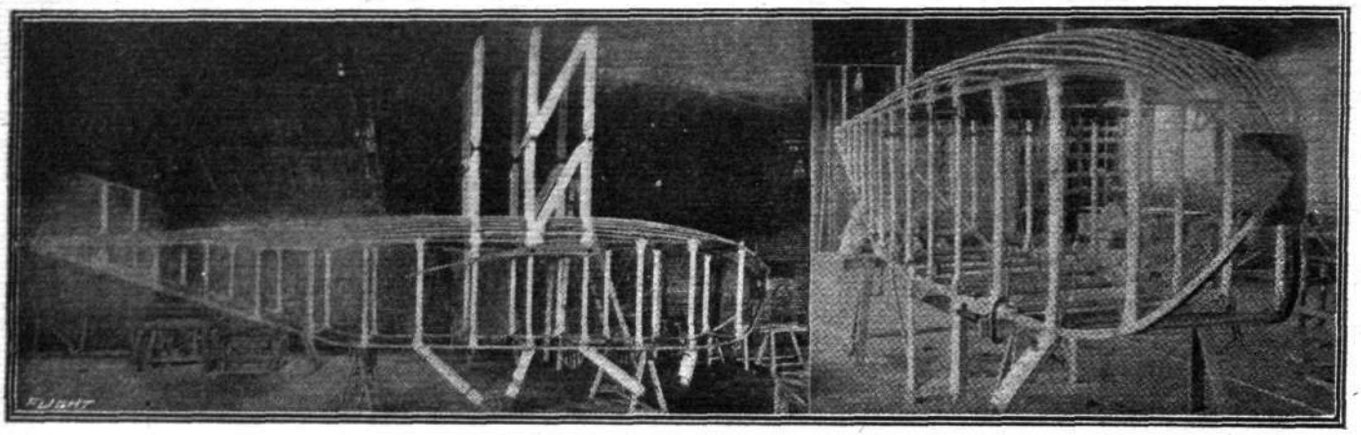
Sturtevants. These are housed in streamlined laminated wood *nacelles*, each of which carries a passenger—presumably to look after the engine. Located in each of these *nacelles* is a 30-gallon fuel tank, fed from the six 40-gallon tanks located in the body of the machine by a special vacuum-feed system. The engines are coupled direct to tractor screws about 10 ft. in diameter. *Ailerons* are hinged to the extremities of the top and middle planes only, and a stabilising plane of some 43 sq. ft. area is



Curve giving lift, drag, and lift/drag coefficients of the Kauffman wing section as used on the C.E. Transcontinental triplane.



THE C.E. TRANSCONTINENTAL TRIPLANE.—Plan, side and front elevation to scale.



Two views of the body of the C.E. Transcontinental triplane in course of construction.

mounted above the stern of the body slightly below the line of thrust. Hinged to the trailing edge of the tail plane is the elevator, which is divided into three by the two partly balanced rudders. Both elevator and rudder controls, as well as that of the *ailerons*, are incorporated in one operating column.

It is intended to build a second machine after the first one has gone through its air tests, and in this second machine steel will be used practically throughout. The principal characteristics of the first C.E. triplane are as follows :—

Span, 59 ft. ; chord, 6 ft. 6 ins. ; gap, 4 ft. ; area of main planes, 1,650 sq. ft. ; overall length, 32 ft. 6 ins. ; weight complete, 5,500 lbs. ; speed range (calculated), 48–98 m.p.h. ; climbing speed, 900 ft. per min. ; petrol capacity, 300 gallons.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Straights with instructor last week : Messrs. Drew, Edwards, Ward, Duncan, Mills, Lyles, Callard, Hodgkinson, Saunders and Jamie. Circuits with instructor : Messrs. Rodocanachi, Cockell and Stevens. Eights with instructor : Messrs. Mulville, Keymer, Goodhart, Parkinson, Phillips, Wellinkar, Donald and Kay. Instructors : Messrs. Hale, Biard, Manton, Pashley, Winter and Russell.

Brevet taken during week : Mr. Turner.

Beatty School.—The following pupils were out during last week : Messrs. Gliksten, Venables, Whitmore, Kay, Hoskins, Dowding, Davy, Edwards, Jones, Murdoch, Garlick, McPherson, Mitchell, Towson, Elliott, Austen, Rudd, Curry, White, Sach, Owen, de Wilde, Wood, J. Squires, D. C. Squires and Gadsden.

The instructors were Messrs. G. W. Beatty, G. Virgilio, A. E. Mitchell, and H. Fawcett ; the machines in use being Beatty-Wright dual control and single-seater propeller biplanes, and Caudron dual-control and single-seater tractor biplanes.

Certificates were taken during the week by Messrs. A. W. Kay, P. S. Whitmore and A. E. Venables on Beatty-Wright biplanes and by Mr. W. E. Jones on a Caudron biplane.

Hall School.—Pupils out last week :—With P. G. Allen (late R.F.C.) : Lieut. Packman, Orton, Barton, Smith, Yuill, Dutton and Course. With C. M. Hill : Skinner, Capt. Deane, Duncan, Sergt. Cottrell-Jones, Collier, and three passenger flights by Dutton, Maude and Yuill. Hall and Caudron (Government type) tractor biplanes in use. Royal Aero Club certificates taken by Mr. Skinner and Capt. Deane.

London and Provincial Aviation Co.—Pupils rolling last week : Messrs. Egerton and Lewis. Doing straights : Messrs. Bush, Daly, Leman and Mander. Ticket practice : Messrs. Jones and Sivewright, Mr. W. R. Jones being ready for "ticket." Extra practice : Mr. J. A. Turner. Instructors : Messrs. W. T. Warren, M. G. Smiles, L. H. Brake and W. T. Warren, jun.

Machines in use : Three tractor biplanes.

Ruffy-Baumann School.—Pupils with instructors last week : Trubridge (15 mins.), Homes (68), Babington Smith (16), Wilson (37), Bebee (49), Williams (1 hr. 10 mins.), De Balme (18 mins.), Thomas (35), Carr (25), Barnes (65), Durand (10), Fanshawe (20) and Capt. Bailey (15). Pupils going alone for circuits and figures of eight : Durand and Wilson. Instructors : E. Baumann, F. Ruffy, A. Thomsen and A. Baumann. 60 and 50 h.p. Ruffy-Baumann biplanes in use.

E. Baumann, A. Baumann and Thomsen out on Saturday afternoon.

Bournemouth School.

PUPILS rolling alone : Messrs. Kennedy, Brandon, Turner, Hinchliff, Pritt, Green, Wingfield, J. B. Smith, Ross and Wilmot. Doing straights alone : O. Wilson, Smith, Adamson, Daniel, Scaramanga, Hammersley, Little and Fenn. Half-circuits alone : T. Wilson and Barlow. Instructors : Messrs. S. Summerfield and Brynildsen. 35, 45 and 60 h.p. Caudrons in use.

Although the weather was very unkind, quite a lot of school work was accomplished, and the usual exhibition flights were carried out by Mr. S. Summerfield, who was ably assisted by E. Brynildsen.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

SPECIAL GENERAL MEETING.

NOTICE IS HEREBY GIVEN that a Special General Meeting of the Club has been convened by direction of the Committee pursuant to Rule 33, and such meeting will be held at the Club premises, 166, Piccadilly, London, W., on **Thursday, July 27th, 1916, at 7 p.m.**

AGENDA.

To make the following alterations in Rule 50, as indicated in heavy type:—

"Rule 50.—The subscription for Members **for the year 1917 and thereafter** shall be £5 5s. 0d. per annum, or such other sum as may be decided upon in General Meeting, and the entrance fee £2 2s. 0d., or such other sum as the Committee may from time to time determine."

New Club Premises.

At the Special General Meeting of the Members of the Royal Aero Club, held on February 17th, 1914, at which Brig.-General The Marquess of Tullibardine, the Chairman of the Club, presided, Colonel Sir Capel Holden reported the result of the replies to the circular issued to Members in October, 1913, with reference to new club premises, when 980 replies were received as follows:—

673 in favour of new premises and an increased subscription.
238 against.
69 in favour of new premises but against an increased subscription.

At the conclusion of a general discussion, the following resolution was carried unanimously:—

"RESOLVED that the Committee be empowered to take steps to acquire new premises by lease or purchase on such terms as it may think proper in the event of a favourable opportunity arising."

Owing to the outbreak of War the arrangements for acquiring a Club House could not be completed, but in view of the fact that the present premises are entirely inadequate for the purposes of the Club and unworthy of the controlling organisation in aeronautics in the British Empire, the Committee thinks that one or other of the suitable premises which have now been offered to the Club should be acquired.

The Committee feels that the utility of the Club is seriously reduced by its not being more suitably housed so that its Members can meet under more favourable conditions. In the present premises the Club is without a dining-room and bedrooms, which is a great disadvantage. If the Club had this accommodation it would be very useful to Members, and especially to Service Members on short leave who now constitute a large and rapidly-growing proportion of the Members of the Club.

It is impossible to run such premises satisfactorily unless the present annual Subscription is raised, and the Committee is of opinion that to meet the necessary expenses the amount should be increased to £5 5s. 0d. The Committee feels confident that the great majority of the Members will be glad to embrace this opportunity of rendering practical assistance in furthering the cause of aeronautics.

July 18th, 1916. B. STEVENSON, Assistant Secretary.

SPECIAL COMMITTEE MEETING.

A Special Meeting of The Committee was held on Wednesday, the 12th inst., when there were present: Prof. A. K. Huntington, in the Chair; Mr. Griffith Brewer, Mr. Ernest C. Bucknall; Lieut.-Col. Mervyn O'Gorman, C.B.; Flight-Commander C. F. Pollock, R.N.; Mr. T. O. M. Sopwith; and the Assistant Secretary.

Election of Members.—The following New Members were elected:—

Lieut. Vivian Gaskell Blackburn, R.N.
Lieut. Eldred Wolferstan Bowyer-Bower.
Second Lieut. Walter Horace Carlyle Buntine, R.F.C.
Flight Sub-Lieut. William Reginald Dainty, R.N.
Maurice Dullfus.
Flight-Commander Christopher Draper, R.N.
Lieut. Henry Duveen, R.N.V.R.
Flight Sub-Lieut. Samuel Denys Felkin, R.N.
Arnold Gabriel.
Kenelm Edward Lee Guinness.
Flight-Lieut. Philip Leslie Holmes, R.N.
Flight-Lieut. Peter Legh, R.N.
Hugh Lewis.
Second Lieut. C. Home McCall.
Lieut.-Col. Walter Grant Petersen Morden (Canadian Staff).
Capt. Arthur Payze, R.F.C.
Lieut. John Alan Guy Swaine, R.F.C.
Major Charles Hillsborough Remington Taylor (4th Essex Regt.).
Capt. Hugh Tomlinson, R.F.C. (S.R.).
Lieut. Hugh Claude Wakefield, R.F.C.
George Leonard Wilford.

Temporary Honorary Member.—On the motion of the Chairman, Mr. Berkeley Powell was elected a Temporary Honorary Member of the Club for two months, viz. to September 12th, 1916.

THE FLYING SERVICES FUND
administered by
THE ROYAL AERO CLUB.

THE Flying Services Fund has been instituted by the Royal Aero Club for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependants of those who are killed.

The Fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers, and men.

Forms of application for assistance can be obtained from the Royal Aero Club, 166, Piccadilly, London, W.

Subscriptions.	£	s.	d.
Total subscriptions received to July 11th, 1916...	10,753	11	11
Collected at the Westland Aircraft Works, Yeovil (Fortieth contribution)	0	15	9
Staff and Workers of Gwynnes, Ltd. (Nineteenth contribution)	8	4	5
Collected by Mrs. Anderson	21	5	6
Total, July 18th, 1916	10,783	17	7

B. STEVENSON, Assistant Secretary.
166, Piccadilly, W.

New German Zeppelins.

IF the *Daily Telegraph* correspondent at Copenhagen is to be credited Darmstadt is now a central flying and airship station, the most important in Germany. In the shed there are ten Zeppelins and a great number of flying machines. He goes on to say that "the Zeppelins recently built are 820 ft. in length, with a gas capacity of 190,675 cubic feet. In the hull is provision for machine-guns and for light pieces of ordnance. The newest Zeppelins are stated to have four armour-plated cars, of which the first is the heaviest.

All the cars are fitted with guns. Armour-plated gangways connect the cars. The engines indicate 4,000 h.p., and the speed is 57 miles an hour. The airships can reach a height of over 13,000 ft."

A Schütte-Lanz at Constantinople.

A REPORT was received at Amsterdam on July 16th from Constantinople, that a Schütte-Lanz dirigible arrived at Constantinople on the previous day, the arrival causing great enthusiasm.

German Seaplane Wrecked.

A TRAWLER reported at Ymuiden, on July 11th, having encountered a German seaplane, No. 549, afloat but with a broken screw. The two occupants asked to be towed to a point six miles from the coast, and while the seaplane was thus being towed they came on board the trawler. After a couple of hours two other German seaplanes approached. One flew off to get assistance, and the other took up one occupant of the wrecked seaplane. Two other machines arrived and took up the second man of the disabled seaplane, which then sank.

AERONAUTICS AT THE N.P.L.

IN the annual report for 1915–16 of the National Physical Laboratory there are the following references to work in connection with aircraft :—

Engineering Department.

The Resistance of Wood to Reversals of Stress.—In connection with an investigation of the strength of aeroplane wing spars, it was desirable to know the fatigue strength of the spruce of which the spars were made. As no data bearing on this could be found, it was decided to make some fatigue tests by the ordinary Wöhler method. To carry out these tests successfully, it was necessary to devise a method of holding the wood in a chuck so that it would not gradually work loose under the action of the reversals of bending moment. After several trials a satisfactory form of chuck was made, which would grip the specimen without danger of its becoming loose after a few hours' running. In preparing the specimens care was taken that the distribution and the thickness of the growth rings in each section should be nearly the same.

The results of the tests are given in the following table :—

Test No.	Range of Stress. lbs. per sq. in.	Total Number of Alternations.	
12	±2,510	5,920,000	Slight crack visible
		12,740,000	Crack extended
		16,860,000	Cracked all round, and failed
13	±1,970	16,250,000	Small crack visible
		23,010,000	Failed
14	±1,625	125,700,000	No apparent crack

It appeared, therefore, that the limiting resistance of this material to alternate tension and compression was above 1,600 lbs. per sq. inch, and below 1,970 lbs. per sq. inch. It was predicted, therefore, that for spruce of this quality the safe range of stress under reversals of bending was approximately ± 1,800 lbs. per sq. inch, or one-quarter of the ultimate stress, which was found to be 6,800 lbs. per sq. inch. In this respect spruce appears to be at a slight disadvantage compared with mild steel, in which the safe limit of stress under similar circumstances is generally about one-third of the ultimate stress.

Aeronautics Department.

Equipment.—The channels provided for aerodynamic research and described in the Reports of the Advisory Committee for Aeronautics, have been maintained in full working order throughout the year. Requests for further tests became so numerous and pressing, to a large extent owing to the war, that two new air channels, 4 ft. and 7 ft. in diameter, have been put in hand and are now almost completed. This additional equipment, and the necessary buildings, provided in response to the wishes of the Admiralty and the War Departments, have been undertaken by H.M. Office of Works, except for the aerodynamic balances and scientific apparatus, some of which has been made by the Cambridge Scientific Instrument Company, and the remainder by the workshop staff of the Laboratory.

The offices originally provided had become insufficient for the greatly increased staff, and in the new buildings suitable office accommodation has been allowed for. A description in some detail of the new building is given in an Appendix to the Report (p. 78).

The chief equipment of the division now consists of two 7 ft. channels, two 4 ft., and one 3 ft. channel, a whirling area 60 ft. in diameter, and a small water channel for photographic records of the flow of fluids.

The two new wind channels follow generally the lines of the older channels, which continue to be satisfactory in use ; some improvements in detail, suggested by previous experience, have been introduced, and in the larger of the two some modifications of the channel itself have been made in order that a larger motor and a higher wind speed might be employed.

The new equipment is now coming into use, but during the last year the amount of experimental work carried out with the older equipment has appreciably increased, partly as a consequence of additional staff, but mainly owing to special efforts on the part of the staff to deal with the greater urgency of the problems arising from the war. It is almost impossible to compare the experimental work with that of previous years, the tests now being of a special character. The continuous investigation, which has hitherto been the main feature of the work of the division, has been continued where possible.

Not only is the scope of the experimental work in the aeronautics division rapidly increasing, but the requests for tests in each section become more numerous. New lines of enquiry have been suggested by the recent work, but in many cases detailed prosecution of the lines of investigation thus opened has had to be deferred to a period of less pressure.

Experiments on Airship Models.—The more important object of the experiments on airship models has been the determination of the effect of the fin area on the restoring couples which follow a displacement. The problem of producing a stable airship is one of considerable complexity, and the mathematical analysis is being proceeded with at the same time as the experiments, the analysis following the lines which proved successful in the case of the aeroplane.

A somewhat allied investigation has been made into the conditions necessary for the equilibrium and the stability of kite-balloons ; the effect of the kite wire introduces constraints of a character not investigated in connection with airships and aeroplanes, and the conditions for stability are correspondingly more complex. Both the airship and the kite-balloon experiments were undertaken in connection with the full scale experiments carried out by the Admiralty.

Experiments on Models of Aeroplane Wings.—In addition to experiments on special aerofoils, a series of experiments has been carried out on the modifications necessary to the wing of an aeroplane, which must both fly at high speed and alight at low speed, the latter being determined by the character of the ground in the fighting areas. Experiments have also been made in relation to the properties of aerofoils forming a biplane combination, the experiments being an extension of earlier experiments, with more modern sections for the aerofoils. The existence of the 7 ft. channel has made it possible to extend the experiments on aerofoils to larger sizes and speeds, and it appears that at the higher speeds and sizes the results closely approach those of the actual aeroplane wing. For most purposes, however, the small channels give results which differ little from those furnished by the seven-foot channel at its highest speed.

Experiments on Models of Complete Aeroplanes and Seaplanes.—The experiments on complete models during the year were greater in number than during any previous period of a year, and were directed mainly to the investigation of the stability and controllability of aeroplanes in flight. The problems arising from the increased air forces relative to the pilot's strength, as the size of aeroplane is increased, have required careful examination of the balancing of the control surfaces. The prediction from the models is fully justified by the results of the tests on the completed aeroplanes.

Tests on Aeroplane Bodies.—Many special forms of body have been tested, in connection with the various dispositions of the gun in an aeroplane, or the special duties of the machine. Other experiments have been made on the combination of body, tail plane and elevator, fins and rudders, the whole forming an important part of the structure in relation to the stability of the aeroplane.

Stability of Aeroplanes.—The previous mathematical analysis of the disturbed rectilinear motion of an aeroplane has been extended, but the chief addition during the year has been the examination of the stability in circling flight, either horizontal or in a spiral. Some effects of the interaction between the longitudinal and the lateral motions were shown to occur, and an estimate of the magnitude was given. The full analysis of the disturbed motion in curvilinear flight has not yet been attempted owing to pressure of other work.

Propellers.—Experiments have been made on a number of propellers, the thrust and efficiency being usually determined at a number of speeds of rotation and translation. A successful attempt has been made to transfer some of the test work from the whirling arm to the wind channels, the advantage to be gained in ease and accuracy of working being considerable. A particularly difficult experiment on the interference between the propeller of an aeroplane and the body was carried out in the 4 ft. wind channel, and further work in this direction will be undertaken from time to time. It is hoped that it will be possible shortly to construct a suitable propeller balance for use in one of the 7ft. wind channels.

Special Investigations.—Several investigations of importance were undertaken during the year, one of these relating to the possibility of obtaining high speeds in aeroplanes, and another to the relation between the design of a propeller and the engine to which it is to be attached. A considerable amount of work has also been done on the resistance and stability of aerial bombs. The most connected series of experiments in progress relates to the efficiency of radiators for aeroplanes, taking account both of the resistance and the rate of cooling.

New Work.

During the year 1916-17 it is hoped to commence the systematic study of steels and steel alloys, particularly for use in connection with aeronautics, while investigations regarding dopes and fabrics are proposed.

AVIATION IN PARLIAMENT.

Petrol for Testing Purposes, &c.

MR. GRANT on July 5th in the House of Commons asked the Chancellor of the Exchequer if the new duties on petrol apply to petrol for stationary engines used for such purposes as lighting?

The Chancellor of the Exchequer (Mr. McKenna): No, sir; though, of course, a licence for the supply will be necessary.

Mr. Peto asked the Chancellor of the Exchequer whether petrol used by motor and aircraft manufacturers for the purpose of testing machines on the bench, on the road, or in the air, is free from the new duty levied on permits for the issue of petrol; and, if not, whether he will insert words in the Finance Bill to that effect.

Mr. McKenna: The answer to the first part is in the affirmative, and the second part does not arise.

The Withholding of R.F.C. Officers' Names.

ON July 11th, Sir Arthur Markham asked the reason why the name of the aviator who shot down Immelmann has been suppressed by the Press Bureau; and why the names of airmen who distinguish themselves are not allowed to appear in the Press?

Mr. Ronald McNeill asked a similar question.

Mr. Forster: It has not been customary to mention in *communiqués* the names of officers or soldiers who perform acts of gallantry, but the matter is being further considered in consultation with the military authorities in France. The name of the aviator who brought down Captain Immelmann was not communicated to the Press Bureau for publication, and consequently there is no question of the bureau having suppressed the name.

Sir A. Markham: The name was actually sent by the *Daily Chronicle* representative to that paper and suppressed by the Press Censor, and the name was Second Lieut. McCubbin, aged 18½ years.

Mr. Forster: I am not aware of that. I was dealing with the allegation that the name had been suppressed by the Press Bureau.

Sir E. Carson: Cannot the hon. gentleman give us some indication as to what is the objection to giving the names?

Mr. Forster: If my right hon. and learned friend will cast his mind back to the earlier days of the war, he will remember—I think I am right—that it was the expressed desire of the officers of the R.F.C. that no mention of individual names should be made.

Mr. MacCallum Scott: Would it not be desirable, on the same grounds, to withhold the names of those upon whom the Victoria Cross is conferred.

Mr. Forster: The names of those upon whom the Victoria Cross is conferred are communicated by the Commander-in-Chief. The Commander-in-Chief, of course, will name any person whom he thinks specially deserving.

Mr. Pringle: Why should an exception be made in regard to these flying officers!

Mr. Forster: For one thing, I do not think the flying officers want it, and, in the second place, it is a matter which, I think, ought to be left largely in the discretion of the Commander-in-Chief.

On July 13th, Sir A. Markham asked whether only officers are engaged as pilots of flying machines on active service; and whether the officers so engaged intimated their desire that their names should not be mentioned in the despatches of the Commander-in-Chief when they had performed acts of gallantry which had received high commendation from the Commander-in-Chief in his despatches?

Mr. Forster: The answer to the first part of the question is in the negative. The name of any officer or man who is mentioned in the despatches of the Commander-in-Chief as having performed an act of gallantry is made public, but it has been considered desirable that the names of officers and men should not be published until the Commander-in-Chief has had an opportunity of considering the merits of the action performed, and comparing it with others which may be equally commendable although, perhaps, less sensational. As I intimated, the question is being further considered. In the work of the Royal Flying Corps particularly those actions which appeal to the public are not necessarily more commendable than many which are performed in the ordinary routine of duty, and only the Commander-in-Chief is qualified to judge the respective merits of each case. I feel sure my hon. friend will realise the justice of this decision. I think what I said in answer to a supplementary question the other day may have given rise to some misunderstanding. When I said that officers of the Royal Flying Corps wished that their names should not be published in the Press, I meant that they did not wish their names to appear in the descriptive articles furnished by newspaper correspondents. I was not referring to mention made by the Commander-in-Chief. That is an honour which officers of the R.F.C. prize as highly as any other officer in H.M. Service.

Air Inquiry Witnesses.

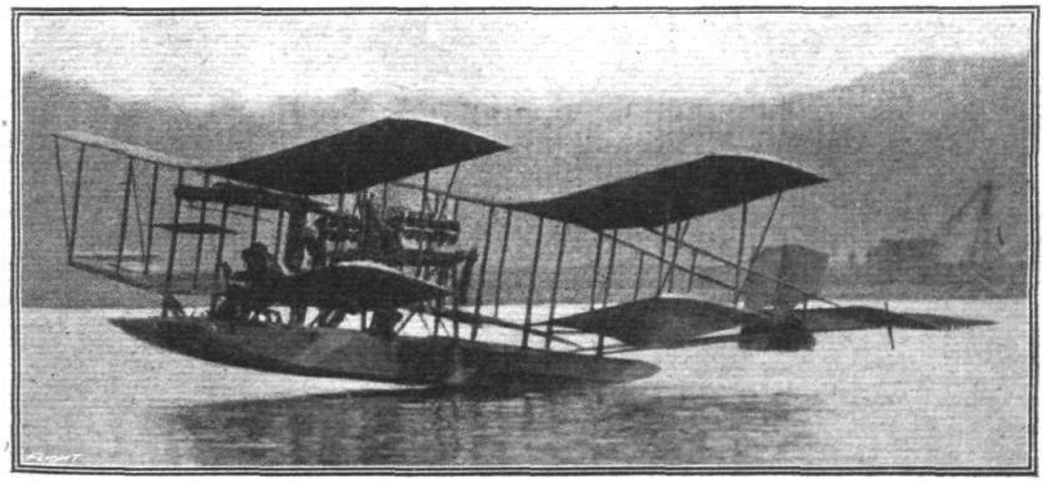
CAPTAIN A. H. BURGOYNE on July 13th asked the Financial Secretary to the War Office whether he has been informed that Driver McDonnell, of the Royal Aircraft Factory, was arrested almost immediately on his return from London, and is now detained at the recruits' depôt, South Farnborough; whether he is aware that this man was one of the witnesses who offered to appear before the Judicial Committee now sitting under Judge Bailhache; whether he is aware that a complete indemnity against victimisation was given in specific words by General Sir David Henderson and confirmed by the Judicial Committee; and whether, under the circumstances, on the identity of this witness becoming known, he can explain the causes of the arrest, and whether he will institute an inquiry into the circumstances of the case?

Mr. Forster: This question was only handed to me after I entered the House, and I have, therefore, had no opportunity of investigating the facts of this particular case. I understand, however, that a complete indemnity against victimisation was given by General Sir David Henderson, and I am quite sure that it will be respected.

Air Raids and Workmen's Compensation.

Mr. CROOKS, on July 17th, asked the Prime Minister whether he is aware of the arrangement come to whereby the provisions of the Workmen's Compensation Act apply in cases of death or injury to railwaymen as the result of enemy raids or bombardments; and whether the Government will consider the advisability of the provisions of the Act being applied to all workmen who suffer death or injury from the same cause during the course of their employment?

The Under Secretary of State for the Home Department (Mr. Brace): I am informed that the railway companies have decided that men injured on duty during air raids or bombardments should be compensated on the same basis as under the Workmen's Compensation Act. In ordinary cases, however, where the workman is not exposed by reason of his employment to any greater danger from an air raid or a bombardment than the inhabitants generally, and the accident is not in any sense due to the nature of his employment, it would not, I think, be possible to place a liability in respect of any injury which the workman may suffer on the employer.



The Richardson tandem-plane, twin-motored hydro-aeroplane being tried near Washington, D.C. Two Robert motors are used. Mr. George A. Gray is the pilot. (*By courtesy of "Aerial Age."*)

THE R.F.C. INQUIRY.

AT the resumed public sitting of the R.F.C, Inquiry Committee on July 11th neither General Henderson nor Mr. Pemberton Billing were present.

Lord Montagu of Beaulieu, who had already given evidence, submitted a tabulated document comparing the R.A.F. 90 h.p. engine with other types, and contended that these showed the R.A.F. engine to be the most extravagant in consumption of petrol and the heaviest per horse-power of six typical engines. He also read a letter from a manufacturer's point of view, which stated that a large number of 200 h.p. engines had been ordered without efficient test being made.

He said that he proposed to call two witnesses, relying upon the intimation by General Sir David Henderson that their position would not be prejudiced.

The Chairman said the promise was General Henderson's. The members of the Committee could neither prejudice nor do anything else to the position of those gentlemen.

Lord Montagu: You consider I am safe in relying on that promise?

The Chairman: We think so, yes.

Lord Montagu added that the witnesses desired to remain anonymous.

The first witness, whose name was written down by Lord Montagu and handed to the Chairman, was referred to as "Mr. A." He stated that he had had long experience in textile manufacture and in engineering and had managed works in England and America. He had been at the Royal Aircraft Factory for four or five weeks, having gone there to learn.

Lord Montagu: Have you noticed whether material is wasted or not?—Oh, yes, a tremendous lot of scrapping, quite excessive. It is reported—of course, I cannot prove it—that 27,000 pieces were scrapped in June.

General Sir H. Smith-Dorrien: Finished pieces, or pieces which did not come up to specification?—Some possibly are half-finished.

The Chairman reminded Lord Montagu that a separate committee under the chairmanship of Sir Charles Parsons had inquired into the Aircraft Factory, and the present inquiry was not concerned with the factory except in the matter of design and manufacture. They were not inquiring into the administration of the Aircraft Factory.

Lord Montagu: That is one point I criticised very strongly, and was asked to bring evidence about.

The Chairman: There has been an independent inquiry about that.

Lord Montagu: I am going to show by my witnesses that that inquiry did not learn the truth that they should have learnt.

The Chairman: We cannot inquire into an inquiry.

Sir Charles Parsons pointed out that if there were 27,000 parts scrapped they would want to know how many parts altogether were made in the month. In the best regulated workshops there was a lot of scrapping through workmen's carelessness. It spoke for nothing.

Lord Montagu: There have been several visits of committees to the factory, and two visits by the King?—Yes; and special instructions were given on these occasions to keep the machines busy in all the shops. Parts of aeroplanes were fixed up to look real, and soon after the King left some of the shops were as empty as they had been before he came.

In other words, there was a good deal of window-dressing?—Yes, a very great deal.

Mr. A—— declared that there was a lack of supervision of persons going in and out of the shops, and that on most fine afternoons the men played cricket. This went on until it became too thick altogether, the men were found out, and six or seven of them dismissed.

The Chairman: Playing cricket in Government time?—Yes, every day they were doing it. Then again there was an extraordinary number of "dud" mechanics. I should say that 25 per cent. of the men employed in the Royal Aircraft Factory are really good men, 50 per cent. are just ordinary people, and the other 25 per cent. are "duds." A lot of them came there to avoid military service; indeed, several actually told me they did.

All sorts of jobs were given to all sorts of men. An ordinary carpenter was appointed a "viewer" for instance. "I don't think," said Mr. A——, "that a carpenter is a competent man to pass material." Another viewer was a jeweller's assistant from Birmingham, and a lorry driver was given the important job of drawing wires.

Mr. Balfour Browne: What is a viewer?—A viewer is a man who inspects material before it is put into the machine.

Lord Montagu: Will you tell us something about the proportion of foremen to workmen?—I never saw a place with so many foremen. The general way of putting it at the Royal Aircraft Factory is, "One man, one foreman."

Mr. Balfour Browne: We really cannot inquire into this.

Lord Montagu: Surely this sort of evidence affects the efficiency of engines and the quantity of the output?

Witness said that he did not get enough work, and he had met a man who had been at the factory for two years and who was leaving because he was "fed up." He was a plumber, and said that he had not done a real day's work in the two years.

Until recently men were paid for bad work as well as good, so that there was no incentive to turn out first-class work except for the good name of the factory. There was now a rule that work was not paid for until it had been inspected.

An order would be given, say, for forty aeroplanes. Material for them would be obtained, and then when ten had been made orders would come down to do no more, whereupon the material for the balance of unfinished machines would have to be "sold cheap."

It was commonly reported that materials which had been scrapped had been buried.

Lord Montagu: Is there anything to prevent men taking things out of the factory?—No. It is reported that one man, who wore a big coat with big pockets, had taken out enough parts to put an engine together.

What is your general impression of the works?—The works are fine. The machinery is tip-top, and cannot be better. If I wanted a man, and he said that he had worked for three years in the Aircraft Factory I should say that I did not want him. A good man would be made lazy. Men are not fully employed, and overtime is worked when there is no necessity. Take my own case as an example. If it is fine weather in the evening I go out and see the country on my motor-bike. If it's raining I go into the factory and draw overtime pay. I think it is monstrous the way in which this business is conducted.

It was stated that the witness had only been at the factory for four weeks, and the Chairman refused to hear him about matters that had occurred before that time.

The Chairman again told Lord Montagu that the Committee were not inquiring into the administration of the factory owing to the fact that an independent committee had inquired into the matter. He said that they were not prepared to hear any more witnesses of that character.

Lord Montagu: I think it is a pity that you do not hear corroborative evidence as to the special preparation made for the visit of the King.

The Chairman: We do not want any more evidence.

Lord Montagu: May I take it that you do not contest that point?

The Chairman: You can only take what I have said.

Lord Montagu: I have a witness here who specially prepared the factory for the visit of the King and the Committee, and he can speak first hand on that point, showing that the factory was "faked" for the purpose. If the Committee do not wish to hear him there is no more to be said. I have my own remedy to make it public through other channels.

Lieutenant Whitehouse, R.N.A.S., was next called. He gave evidence when the Committee was sitting *in camera*, but desired publicity for his statement, and therefore attended again.

His evidence was a denial of the statement that when a R.F.C. machine fell into the sea at Dover he prevented two of his officers going to the assistance of the pilot, and reprimanded and punished them for so doing, and that he refused to render assistance to safely land the aeroplane.

Witness explained that the machine alighted about 50 yards from the shore in 3 ft. or 4 ft. of water. A party equipped with waders for handling seaplanes waded out to the machine, and a motor-boat also. He did not know then whether the aeroplane belonged to the Naval service or the Flying Corps. He only gave orders that the skilled ratings were not to knock off their work, because it would have meant delay in work on machines which were urgently required. The aeroplane was towed in, and subsequently R.F.C. mechanics came and took it apart, loaded it on a lorry, and took it to their aerodrome. The officers he reprimanded were two who left their station without his permission or orders in the motor-boat. There was no question of saving the life of the pilot. The pilot did not even get wet, and could easily have waded ashore. Therefore the statement that he said the pilot ought to have stayed there and drown was absurd. As to the ill-feeling between the two services it might or might not exist. As far as he knew it did not. Before and after this incident several R.F.C. machines had been salved.

Dr. R. Glazebrook, Director of the National Physical Laboratory and Chairman of the Advisory Committee for Aeronautics, gave

technical evidence regarding the stability of aeroplanes. Asked if the B.E. 2 C was an efficient and satisfactory machine, the witness replied, "Thoroughly." It was not easy, he said, to combine all the qualities that were required in an aeroplane in one design, and the B.E. 2 C was a compromise in the matter of climb, speed, and engine power. The "R.A.F." designs were the result of careful scientific study of the problems of aviation. The evolution of the B.E. 2 C would have been impossible without the assistance obtained through the experimental work at the National Physical Laboratory.

Professor Pètaval, professor of engineering at Manchester and member of the Advisory Committee for Aeronautics, stated that the B.E. 2 C. was more easily controlled than many others, and had many advantages.

General Arbuthnot, chairman of the Aerial League, and formerly superintendent of the Small Arms Factory at Enfield, expressed the opinion that it would be better to fight Zeppelins with aeroplanes than by building Zeppelins for the purpose.

Second Lieutenant W. T. Blake, assistant adjutant at Farnborough when Lieutenant Littlewood started to fly to France on June 1st, on a new machine, which eventually landed in the German lines at Lille, said that they were instructed that two officers would report, Capt. Archer and another pilot, name not mentioned. The witness had selected an experienced mechanic who had flown across half a dozen times to go as an observer, when a telephone message came either from the War Office or the 6th Brigade that Capt. Grant, a Staff officer, was to go over to France on that day, if possible, in an F.E. machine. When Capt. Grant arrived Capt. Archer had gone, and he was allotted to Lieut. Littlewood, who had to take him to St. Omer. The adjutant who took the message was seriously ill, and the witness did not know where it actually came from. It was a frequent occurrence, after an observer had been selected, for a staff officer to be sent down to go across to France in an aeroplane.

Colonel O'Gorman, Superintendent of the Royal Aircraft Factory, explained in detail many technical points in connection with engines and designs, and afterwards stated that it was not true that a large number of engines that had been ordered were not tested.

Witness asked permission to reply to the statement that cricket was played in Government time at the factory. There was a piece of ground on which men played in their own time, and on one Saturday four men who had not signed on were playing cricket. Two men who had signed on, and were in the Government's pay at the time, joined them. They were dismissed. That was the only occasion he knew of on which cricket had been played at improper times. It might often happen that men were playing in their own time, while others close by were at work.

Replying to Mr. Bright, Colonel O'Gorman denied absolutely that any design of any sort had been copied at any time from private firms by the R.A.F. He did not know the witness whom Lord Montagu had called in regard to waste at the factory and other matters. He did not know what work he did in the factory; he had seen him strolling about occasionally. He accepted the statement respecting 25 per cent. of the workmen being "duds," and took credit for his scheme of the dilution of labour in time of war. He was letting every fit man go out that he could spare, and was making shift with the best operatives he could get.

Colonel O'Gorman referred to the other "curious charges," but was reminded that the evidence had been ruled out. As to the alleged "window-dressing," he explained that the King's visit took place shortly after His Majesty's accident, and in order that he should not have too much walking, certain aeroplanes were moved out. A few things were arranged to make it a little more easy for Royalty to see.

Mr. Balfour Browne: That is all the window-dressing that took place?

Witness: Yes. The same thing was done when General Sir H. Smith-Dorrien came down.

With regard to the statement that scrapped parts were buried, he said that one of his predecessors was "a great magpie," and buried old material, such as old wheels, gun slides, and lumps of iron, to remedy the boggy state of the ground.

The Committee then continued taking Col. O'Gorman's evidence *in camera*.

On the following morning Major Dawes was called to give evidence in reference to No. 29 squadron of aeroplanes, which left Gosport for France in March last, and to which an accident happened.

Major Dawes said that ten of the twelve machines left Gosport and six had a forced landing in this country owing to a snowstorm which they encountered. In four cases the machines were broken, and two officers were injured. Two machines left from Hendon, and these arrived at Dover and Folkestone.

The Chairman: It is suggested that the pilots asked to be allowed to test the machines, and they were refused. Do you know anything about that?—No, I know nothing about it. I cannot imagine the request being made.

This was rather a disaster, was it not?—It was.

The sort of thing one would not expect to happen?—No.

The kind of thing that ought not to happen?—It should not happen.

Can you give any explanation of why it did happen?—I do not think that it would have happened if they had not run into this very heavy snowstorm.

Is a snowstorm sufficient to account for it in your opinion?—Not altogether.

It should not have had such a disastrous effect, should it?—No.

Making full allowance for the snowstorm, what do you think, in addition, was the cause of this disaster?—Really the fault was that the pilots had not sufficient experience to meet what they had to meet on that journey. Had the weather held up they would have been quite all right; but, meeting this heavy snowstorm, they had not sufficient experience to compete with it. A snowstorm is a very nasty thing to meet on this type of machine. Two pilots who had had a considerable amount of experience and had been to France, came to grief. There was one case of engine trouble, and the pilot came down between Shoreham and Hastings. I do not think the two machines from Hendon which arrived safely at Dover and Folkestone passed through the snowstorm.

Witness said that as far as he was aware no inquiry was held. He could not say whether the pilots were examined as to the causes of their accidents.

The Chairman pointed out that the reports spoke of 26 or 27 machines being "consumed," that is, rendered unserviceable or damaged; what became of the remainder?

Witness replied that he knew that five machines were collected to replace those broken, and he believed that one or two of these were broken at Dover.

The Chairman: I should have thought that a happening of that kind would have created considerable stir in the Flying Corps, and that some inquiry would have been held. That strikes me as rather strange. You don't know of any inquiry?—Not as far as I am aware. The occurrence took place in March of this year.

Mr. H. Franklin, chief examiner at Hendon, gave evidence regarding the allegations made by Mr. R. F. Curtis, an inspector, of the falsification of time-sheets. He said that up to January 23rd the hours of inspectors were from 8.30 a.m. to 7.30 p.m., but they did not arrive at the stated hour, and they were allowed to go when they had finished the work they had in hand. Their wages were £2 10*s*. per week. Then from January 24th the hours were fixed at 48 for £2 10*s*., and the men were paid overtime.

The Chairman: That was a pure gift from somebody unasked and without agitation.—Yes.

Somebody you did not know suddenly gave a present of a considerable sum of money to these people?—Yes, sir.

Do you think that sounds very likely? How does it strike you?—Well, it was so. We were told that overtime was to be paid from January 24th.

And they all said: "Thank Heaven for that"?—Yes, it was nice to have it.

Can you account for the fact that after this alteration the men worked regularly from 8.30 to 7.30?—I cannot understand it.

Does it not seem rather suspicious?—On the face of it, yes.

The Chairman: Then if Curtis signed his time-sheet for the actual hours he worked the time-sheets of the other men would look very suspicious?—I do not know about that at all.

Why didn't you ascertain what the other men signed for?—I thought it was so trifling that I did not take any trouble to find out.

Witness denied that he saw Curtis and said to him, "Cannot you see that you are letting the other chaps down?" At the request of the Chief Examiner, Curtis was removed from the station. He afterwards became ill, and a draft letter was found on him.

Colonel Bagnall-Wild, Chief of the Aeronautical Inspection Department, explained in detail the method of timekeeping at Hendon, and said the change was made because he could not get men at £2 10*s*. per week, and he could not compel them to work more than 48 hours a week, as it was a condition of their engagement. All overtime after 48 hours was voluntarily undertaken. The 8.30 to 7.30 day merely represented the length of day fixed upon as being necessary to get through the work. It varied at different stages, according to the amount of work coming through. The overtime rate was granted because it was difficult to get men at the old rate, and he felt he could not ask them to do overtime on a voluntary basis. The step also conformed to the trade custom. At first there were about fifty inspectors, and now there were 2,000 at all the controlled works. Several examiners, Curtis amongst them, refused to work overtime, saying there was no justification for it. The witness considered Curtis's allegations were totally unfounded, and he denied that the inspection was bad.

The Chairman said that the substance of the letter found on Curtis was that he complained that whereas he himself signed his time sheets for the actual time he worked, the other men signed for the regulation hours; that complaint had been made against him because he signed for the actual hours, thereby casting doubt on the other men; and that he had been asked to sign the same as the other men, whether he worked the hours or not.

After inspecting the time sheets, the Chairman asked witness if his suspicions were not aroused by the extreme regularity of the hours and the uniformity with which the men put down 8.30 to 7.30.

Colonel Wild replied in the negative, adding that he took steps to check the time. Curtis would not work overtime.

The Chairman remarked that Curtis's statement was that there was no justification for overtime, and that the men ostensibly wasted their time.

Colonel Wild: He made that statement, and I consider it unjustified.

Colonel O'Gorman, recalled, was asked by the Chairman to explain the use of dope which was said to be poisonous at the factory. The witness stated that complaints came from the Home Office that the dope used was "giving trouble all over the place." The dope used up to July, 1914, contained a substance of a poisonous nature which kept it soft and prevented cracking when placed on the wings. Efforts were made to obtain a dope containing less poison, and the danger had been greatly diminished. Better regulations as to its use had also been adopted. A material, which he called X, because he did not believe it was known abroad, was discovered to be a non-poisonous substitute, but it was a by-product of the dye industry, and was not obtainable in the whole of England. It was now being produced, but not in sufficient quantities yet.

Mr. Butcher called Colonel O'Gorman's attention to a statement put in by Lord Montagu on Tuesday that in regard to the manufacture of aeroplane engines the R.A.F., instead of encouraging British manufacturers to build engines, had tried to keep the monopoly in their own hands.

Colonel O'Gorman: There is absolutely no truth in the statement—not a shadow of truth in it. Nothing but a distortion of attempts to help people, he said, could be made to look anything like that. Engines had been mothered by the R.A.F.

The Chairman said that the criticism directed against the factory put an "S" before the word mothered.

Colonel O'Gorman: I have not built more than four experimental engines at the factory, and there is no kind of monopoly as regards construction. Of aeroplanes we have produced something less than 2 per cent. of the total. If we had attempted to secure the monopoly for the manufacture of engines we should have been cutting our own throats, seeing that we could not produce anything like the number required.

The Chairman: The fact that you employ over 4,000 men has led people to suppose that you are a large producing factory. What is the necessity for so many persons being employed if you have only produced four experimental engines and 77 aeroplanes?

Colonel O'Gorman replied that the R.A.F. did all the jobbing work for the Flying Corps, making every kind of "oddment that anybody at any time could not make or get." War wastage, for instance, was very great, and they had to make spares for the machines at the front. All the material made in the factory was made by hand and not manufactured. The word "factory" was a little misleading; it was a laboratory on a full scale. Various engineers belonging to manufacturing firms had made countless visits to the factory, and they knew there was no competition. The functions of the factory were experimental and jobbing, and instructional and development work was carried on. A large amount of experimental work, practical and theoretical, was also carried out at the factory, the results of which were at the disposal of manufacturers. They experimented in chemistry as well.

The Committee afterwards sat in private, and adjourned *sine die*. It is understood that no further evidence will be taken in public, and that an interim report is likely to be issued.

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R.A.F. Employee in Trouble.

AT Aldershot on July 14th Driver McDonnell, A.S.C., employed at the Royal Aircraft Factory, Farnborough, was charged before Mr. R. Simmonds with stealing Government property (aeroplane parts), and further with being in unlawful possession of the same. After formal evidence he was remanded.

Later in the day McDonnell was brought before Mr. W. T. Robertson and remanded until Thursday, being admitted to bail on his own recognisances in £50.

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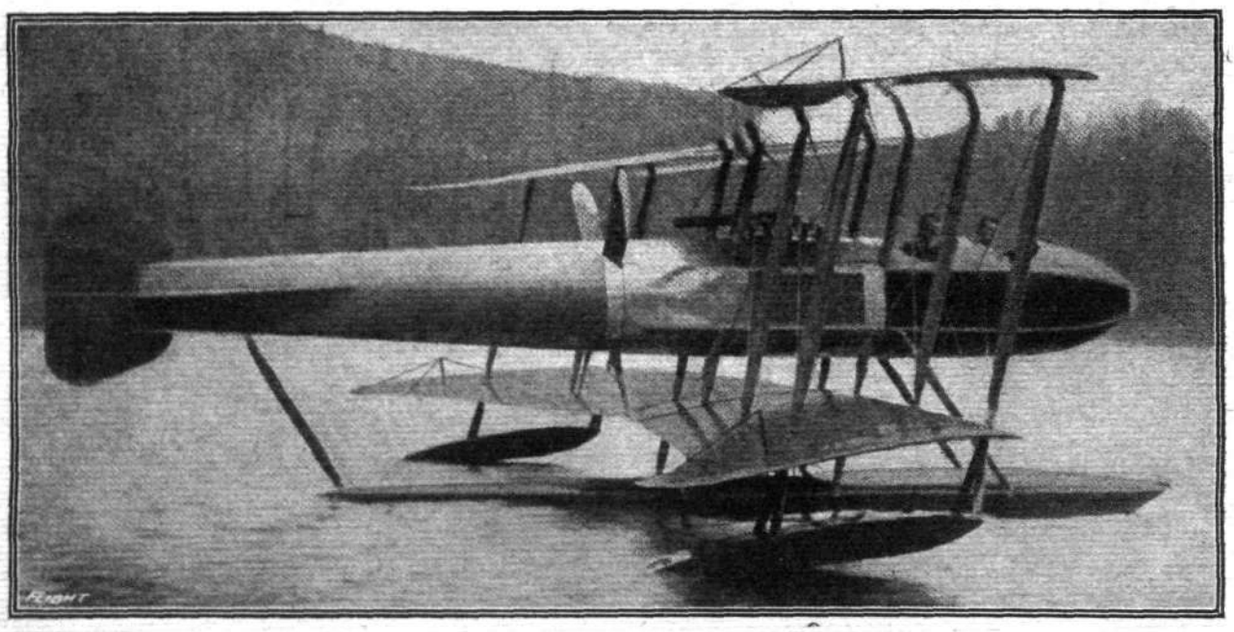
Military Service Act and the R.N.A.S.

IT is authoritatively stated that the Navy Group system is still open, and that men who have joined the Navy Groups for the Royal Naval Air Service cannot be charged as absentees under the Military Service Act. All enquiries relative to the Royal Naval Air Service should be addressed to the R.N.A.S. Recruiting Office, Brook Green, Hammersmith, W.

It is stated, however, that men who have appealed for exemption from Army service are eligible in the Navy only for *immediate* service.

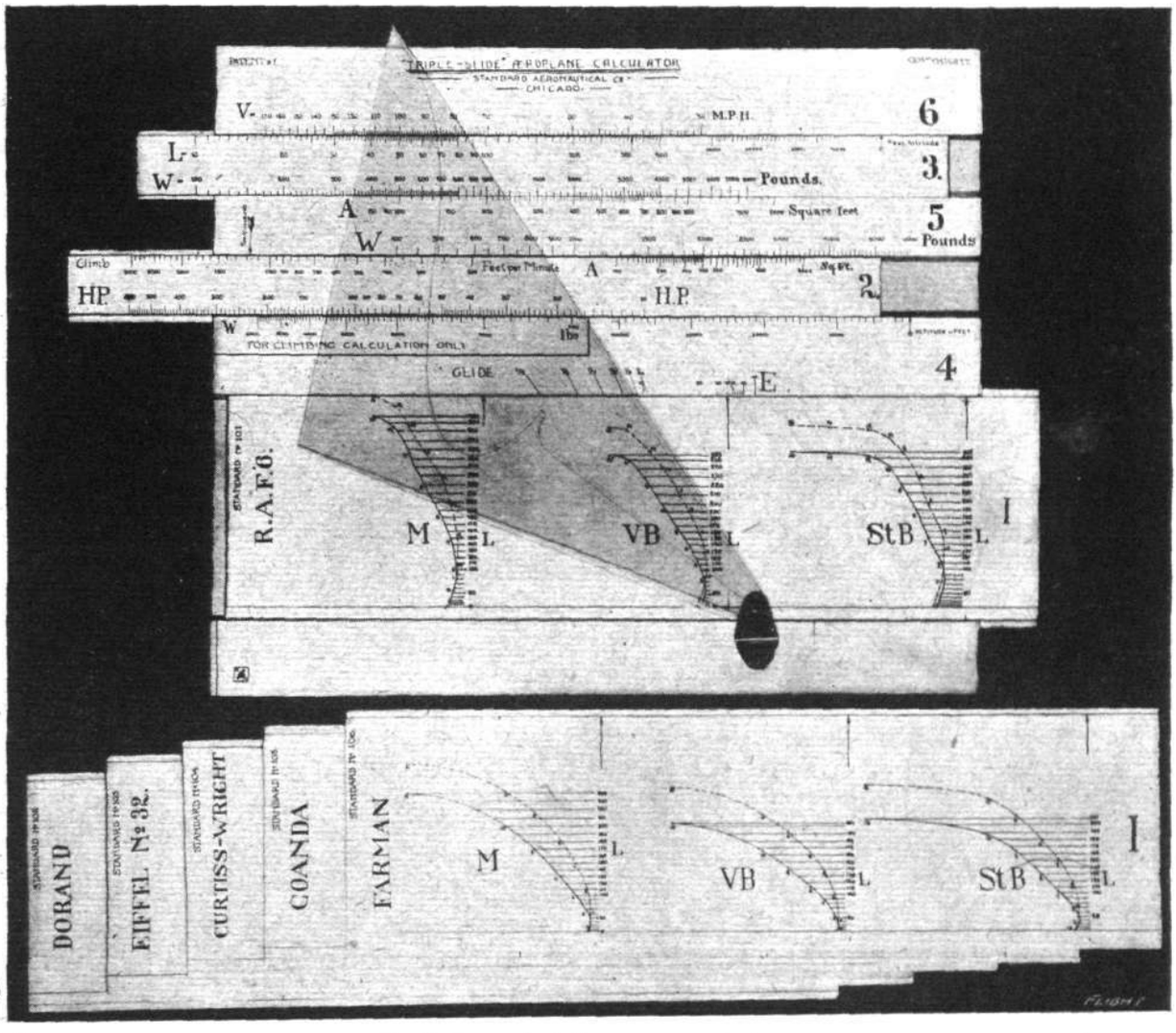


AN INTERESTING EXAMPLE OF A PUSHER *FUSELAGE* BATTLE SEAPLANE FROM AMERICA.—The principal features of this machine, which has been built by the Gallaudet Co. of Norwich, Conn., for the U.S. Navy, consist of the arrow-form wings, and the four-bladed propeller (driven by two 150 h.p. Duesenberg motors) bisecting the *fuselage*. A clutch connection between each engine and the propeller enables either one or both engines to be used. A speed of 100 m.p.h. is claimed with both engines running, and 70 m.p.h. with one engine. Machines embodying this form of propulsion were designed several years ago by M. Coanda (Bristol), and M. Pateras Peseara, both of which were tested at M. Eiffel's laboratory, whilst other examples are to be found in the Borel and Blériot pusher monoplanes of 1912–3, and the Grahame-White Military biplane of 1913. (*By courtesy of "Flying."*)

FLIGHT

THE "TRIPLE-SLIDE" AEROPLANE CALCULATOR.

WHEN the ordinary engineer's slide rule was first introduced many people were inclined, and some still are for that matter, to shrug their shoulders at it, and regard it as an ingenious and rather amusing toy, not adapted, however, for any serious work. Although some of the objections raised against it—such, for instance, as lack of accuracy—were to some extent justified as regards the smaller sizes, the fact remains that the slide rule is now used extensively in all engineering offices, where it effects a considerable saving of time, and has, in the larger sizes, been found quite accurate enough for all practical purposes.



The "Triple-Slide" aeroplane calculator.

The "Triple-Slide" aeroplane calculator manufactured and sold by the Standard Aeronautical Co., of 224, S. Jefferson Street, Chicago, Ill., U.S.A., has been designed to supplement the slide rule for the special calculations involved in aeroplane design. In principle it is founded on the interdependence of the characteristics of the wing section employed, the weight, area, resistance and horse-power of the machine.

The instrument consists, as will be seen from the illustration, of a base numbered 4, 5, and 6, and of three movable slides numbered 1, 2, and 3. Slide No. 1 is the wing curve slide, and on it are printed three curves for the particular section in question. The first gives the lift coefficient for a monoplane (M.), the second the lift coefficient for a vertical biplane (V.B.), and the third that for a staggered biplane (St. B.). The biplane values, it will be seen, are arbitrary, and are for one value of gap and stagger only, but as in most modern machines there appears to be a tendency towards uniformity in gap and stagger, the figures given will probably be sufficiently accurate for ordinary purposes. For each of the three types there are two curves, one full line and one dotted, both marked at intervals with figures indicating the angle of incidence. The dotted line is to be used only in calculating the gliding angle, the full line for all other purposes. On the right hand side of each scale is the lift coefficient L.

Slide No. 2 is known as the power slide, and is used in all calculations where the horse-power is a factor. In a similar way slide No. 3, the speed slide, is used for all calculations where speed is a factor. A turnable indicator in the form of a celluloid triangle is pivoted at a point near the bottom of the base of the instrument. On this triangle are drawn two lines, one straight and one curved. The straight line is used in connection with the full lift curve of the wing section, and also in calculating

the gliding angle from the dotted curve, while the curved line is used to intersect the h.p. on slide No. 2.

As the wind resistance of the machine is an important factor in the calculations, it is necessary to know the resistance of the aeroplane under consideration. As this is not always known, a table is given in the book of instructions accompanying every instrument, in which are given the detrimental head resistances of a number of various types, ranging from an equivalent normal area of 6 sq. ft. for a small fast monoplane to 20 sq. ft. for a twin-engined battleplane. These figures are, of course, only approximately correct, but for first estimates the error involved is probably not of serious moment. That they are not and cannot be absolutely accurate will be realised when it is remembered that no allowance is made for variation of resistance of items in the slip stream according to the amount of slip given by the particular propeller used. In the tables of head resistance is not included the resistance of the supporting surfaces, and in order to obtain what the inventors of the instrument call the "efficiency of construction," designated on the base of the calculator by the letter E, it is necessary to divide the area of the main planes by the number of square feet of detrimental head resistance. If, for instance, the area of the main planes is 400 sq. ft., and the detrimental head resistance is 10 sq. ft., the efficiency of construction E is 400 ÷ 10 = 40.

A list of some of the characteristics that may be calculated by means of the "Triple-Slide" will give an idea of the usefulness of this instrument. The speed at any angle of incidence, the landing speed, the climbing speed per minute, the maximum attainable altitude, and the speed at this altitude, the economical speed, minimum and maximum speed, minimum horse-power, greatest possible flying weight and useful load, gliding angle, &c.

A numerical example of one of the calculations that can be made by means of the "Triple-Slide," although not explaining the complete manipulation of the instrument, will give a good idea of the simplicity of the operation. Let us suppose that we have a machine weighing 2,000 lbs. "all on," with an area of 400 sq. ft., and an engine developing 100 b.h.p. The wing section is the R.A.F. 6, and the machine is a vertical biplane. In the book of instructions the detrimental area is given as 10 sq. ft., which may be considered sufficiently accurate. Taking the propeller efficiency as 75 per cent., which is a fair average, we obtain 75 as the propeller horse-power. The "Efficiency of Construction" = E = A/DH = 400/10 = 40. On slide 1 we connect the arrow with E40. On slide 2 connect W2000 with A400. On slide 3 connect W2000 with A400. Turn the indicator until it intersects HP on slide 2 at 75. It is found that the indicator intersects the full line wing curve on slide 1 at L80. On slide 3 L80 is connected with V78·6, which is the maximum speed. The highest value of L on the full line wing curve is found to be 255. On slide 3 we find L255 connected with V44·2, which is the minimum speed. The speed range is, therefore, 44·2 to 78·6 m.p.h.

If it is desired to find the gliding angle of the same machine as above, all the slides are kept in the same position, and the indicator is turned tangent to the dotted line wing curve. The indicator will then be found to intersect (4), the base of the instrument, at 1/7. The gliding angle is, therefore, 1 in 7.

With each instrument is furnished a set of standard wing curves complete for calculations of monoplane, vertical biplane and staggered biplane, comprising the following sections: Eiffel No. 32 (Lanier Lawrance), Eiffel No. 35 (Commandant Dorand), Eiffel No. 38 (Coanda), R.A.F. 6, Farman, and Curtiss Wright. Extra slides can be furnished at a dollar each, if they are of sections tested at a laboratory, or designers who are using their own section will be furnished with a laboratory test of same and a slide, for $55, provided they supply a model of their section measuring 3 ins. by 18 ins. The price of the "Triple-Slide" aeroplane calculator with a standard set of wing curves is stated to be $15 (about £3) for the first fifty purchasers, and after that $25.

We understand that arrangements are being made for an agent in England, and that the instrument will be on the market here very shortly.

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AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

British. *General Headquarters, July 11th, 12.48 p.m.*

"In continuation of my report on the aerial combats of Sunday, one of our aeroplanes was shot down by a direct hit from an anti-aircraft gun, and three other machines have not returned to our lines."

8.30 *p.m.*

"Apart from a number of guns hidden in houses buried by *débris* and the like, we have in the course of these operations brought in 26 field guns, 1 naval gun, 1 anti-aircraft gun, and a heavy howitzer, while the number of German prisoners captured exceeds 7,500."

July 12th, 1.32 p.m.

"Several combats took place in the air on the 10th, as a result of which we destroyed one German machine, while one of our own machines was brought down by the enemy's gunfire."

General Headquarters, July 13th, 2 p.m.

"Despite the unfavourable weather, our aeroplanes have been constantly at work. Hostile machines were active, but all their attacks on our aeroplanes operating over the German lines were driven off. One of our aeroplanes is missing."

War Office, July 13th.

"*Mesopotamia—Tigris Line.*—On the evening of the 11th the enemy's artillery and aircraft were both engaged in an ineffectual bombardment of our trenches. No material damage was done. On 12th the temperature was 117 deg."

French. *Paris, July 12th. Evening.*

"In the region of the Somme our aeroplanes fought 14 actions yesterday. Four enemy machines, badly hit by our machine guns, were forced to dive suddenly. One of our pilots brought his machine, which was on fire, back to our lines and landed without accident.

"Our bombardment squadrons were active last night. Two hundred and twenty bombs were dropped on various stations, where great excitement was observed, particularly the stations of Ham, La Fère, and Chaulnes."

Paris, July 14th. Evening.

"In reprisal for the bombardment by the enemy on the open town of Lunéville on the night of June 24th one of our airmen, flying at a height of 1,500 ft., last night dropped several heavy bombs on the town of Mülheim (east bank of the Rhine)."

Paris, July 16th. Afternoon.

"In the region of the Somme our aeroplanes displayed great activity. Four German machines attacked by ours over the enemy lines were brought down. Two others, badly hit, were obliged to descend.

"In the region of Verdun one of our aeroplanes set fire to a captive balloon.

"During the night of the 15th one of our air squadrons bombarded the stations at Hombleux and Roisel, and a heavy battery near the latter. During the same night another squadron dropped numerous bombs on the stations of Abbecourt, Tergnier and Chaumy."

Paris, July 16th. Evening.

"On the morning of the 16th two enemy aeroplanes were brought down in the Somme region, one of them by Second Lieutenant Guynemer. This is the tenth aeroplane that this officer has brought down.

"During to-day Sergeant Rochefort brought down his fifth enemy aeroplane."

Russian. *Petrograd, July 11th. Afternoon.*

"Enemy airmen attacked the station at Zamirie, on the Minsk-Baranovitchi railway line, and dropped sixty six bombs."

Petrograd, July 11th. Evening.

"The combats in the region of the Stokhod continue. Enemy aeroplanes are flying in great numbers above the rear of our armies, dropping bombs and opening fire with their machine-guns."

Petrograd, July 12th. Afternoon.

"German aviators have dropped bombs on the station of Zamirie and the town of Niesvij, where several houses were set on fire."

Petrograd, July 13th.

"There was an artillery duel. Some enemy aeroplane squadrons flew behind our lines, dropping bombs and firing with machine guns."

Petrograd, July 17th.

"A Zeppelin flying over Riga dropped 13 bombs on different quarters of the town."

Italian. *Rome, July 11th.*

"A semi-official statement says: This morning at daybreak some of our units effectively bombarded the enemy seaplane base at Parenzo (south of Trieste), in spite of the intense fire of the new defence batteries."

Rome, July 12th.

"Hostile aircraft dropped bombs on Latisana causing a fire, which was promptly extinguished.

"Our air squadrons on Monday bombarded Tione, in the Giudicaria, and on Tuesday the enemy's camps at Monte Rover, north-east of Lavarone. Our machines returned safely."

Rome, July 14th.

"Last night hostile aircraft dropped bombs on Padua. The damage was slight, but two persons were killed and a few wounded."

Rome, July 17th.

"On the 15th our aircraft bombarded the camps in the Folgaria area.

"Throughout yesterday the enemy displayed much aerial activity, bombarding several points in the Camonica and Adige valleys, but no casualties or damage ensued. Our batteries drove off some hostile aircraft which were making for Bergamo, Brescia and Padua. Last night five hydroplanes dropped bombs on Treviso, killing one person and wounding a few. One of the machines was brought down by our fire; the two occupants were killed."

German. *Berlin, July 11th.*

"Vigorous aerial activity resulted in numerous air fights, in which the enemy lost two machines on the Somme and two others west of Vouzieres.

"Near Courcelette, on the road from Bapaume to Albert, a British biplane was shot down by our anti-aircraft guns.

"Our air squadrons abundantly bombed troop transports near Horodzieja, on the line Baranovitchi-Minsk, and repeated their attack on the Russian dug-outs east of the Stodhod."

Berlin, July 12th.

"A British biplane was compelled to land in our lines near Athies. An enemy aeroplane fell down near Soyecourt, and another was brought down by our anti-aircraft guns near Chattancourt. Near Dombasle a captive balloon was shot down by our airmen.

"Our air squadrons made attacks east of the Stokhod. An enemy captive balloon was shot down."

Berlin, July 13th.

"North of Soissons a French biplane was forced to descend within our lines."

Berlin, July 14th.

"Our air squadrons successfully repeated their attacks east of the Stokhod."

Berlin, July 15th.

"Numerous bombs were dropped on railway stations where there was heavy traffic on the line Smorgon-Molodetchna. Trains conveying troops at the railway station of Kiverzy north-east of Lutsk were attacked by our air squadron, with good results."

Berlin, July 16th.

"West of Loos an enemy aeroplane was shot down by our infantry fire. It fell down within our entanglements, and a biplane, damaged by our anti-aircraft gun-fire, fell into our hands near Nesle."

Berlin, July 17th.

"On July 15th two further French aeroplanes were put out of action besides those announced yesterday, one in an air battle behind the enemy line south of the Somme, the other by being shot down from the ground near Preslincourt (Oise), on our front."

Austrian. *Vienna, July 12th.*

"Near Obertyn, in East Galicia, an Austro-Hungarian airman shot down a Russian Farman biplane.

"Our seaplanes bombed the military works and railway station at Latisana (north-east of Venice), causing several big fires."

Bulgarian. *Sofia, July 13th.*

"The enemy persists in his attempts to destroy the fruits of the labour of the peaceful population in the lower valley of the Mesta by daily dropping incendiary bombs with the object of burning the crops already cut. Owing to our effective measures he obtains no result from this means. The reconnoitring activity of our airmen increases daily, furnishing examples of praiseworthy activity."

Turkish. *Constantinople, July 15th.*

"An enemy biplane, pursued by one of our airmen, was forced to land in the island of Tenedos."

From Other Sources.

The Paris correspondent of the *Times*, writing on July 7th, says:—

"Nesle, Voyennes and Ham are other important railway centres to the south of Péronne, and upon these points the French aeroplanes have been actively engaged destroying railway buildings."

A telegram received in Paris from Salonica on July 11th says General Sarrail made an inspection in an aeroplane of the enemy's dispositions lasting three hours.

In a long despatch, dated "With the French Army on the Somme, July 13th," Mr. H. Warner Allen, the British press representative with the French Forces, says:—

"A fleet of aeroplanes, flying low, went forward with the French infantry. As a rule, the infantryman on the ground below watches the duel of airmen far away. In the Somme offensive, for the first time, aviators and infantry went into the battle close together, and each infantryman felt that he was in immediate communication with the aeroplane above his head. Many a soldier, as he paused for a breathing space, waved his hand approvingly to the aviator, who was watching him from above. The aeroplanes were only five or six hundred feet up, and it was their duty to warn the French batteries behind as to the progress made, so that the men should not suffer from the fire of their own guns. The progress of each unit was announced to the aviator above by signals. The kite balloons, watching the battle from the rear, were often at a loss as to the position of the advancing lines, but the airmen never made a mistake. To the inexpressible joy of the infantry, the French shells fell exactly where they were needed, just ahead of their lines, and moved steadily forward with their progress. And, though the aeroplanes received plenty of bullets and shrapnel in their planes, not a single one was brought down.

". . . . With heavy artillery the problem of giving eyes to the gunners, who are miles and miles in the rear, becomes increasingly difficult. The Germans first sought the solution in the kite balloon, or sausage, which was a valuable supplement to the aeroplane. At first they had practically a monopoly of the kite balloons, but now the tables are turned. The Allied aeroplanes were able to work havoc among the kite balloons, and on the Somme front yesterday one could see 20 French kite balloons and not one single German. Despite all efforts the enemy has been able to demolish only one French balloon, and that by an unsportsmanlike device which smacks of sailing under false colours. A German aeroplane, disguised as a French machine, with tricolour discs painted under its wings, succeeded in slipping through the French air patrols and destroying a captive balloon with explosive bullets.

"The French have in this district complete mastery of the air, and, consequently, the German guns are blinded. If the enemy dares to run up a kite balloon, it takes all its force of aeroplanes to protect it. One of the great difficulties in the battle of Champagne was that of informing the artillery of the progress made by the infantry. This problem has been most satisfactorily solved by the 'infantry aeroplanes.' . . . .

"The Germans had evidently realised that their defences on the Somme might prove unequal to resisting the pressure of the French. On June 25th, at the very beginning of the artillery preparation, which only reached its height on the last three days of the month, they evacuated all the civilians in the threatened district. Apparently very short notice was given, but the peasants should not have

been unprepared, since thousands of proclamations had been dropped by French aeroplanes among the villages announcing that the Allies armies were coming.

"After the first day's attack the enemy discovered that his worst fears as to the French offensive had been fulfilled, and that there was no chance of serious resistance on his first and second positions. He immediately withdrew, so far as was possible, all his advanced batteries not absolutely indispensable for the continuation of the struggle, to save them from the hands of the advancing French. . . . They have had to continue the struggle in the open, and take their chance of being discovered by a French aviator and being destroyed by the French batteries."

In the course of an interesting description in the *Vossische Zeitung* of the Allies' tactics in their present offensive, Lieutenant Alfred Dambitsch, who was wounded in the recent fighting on the Somme, writes:—

"The plan of destruction of the German front (he says) necessitated gaining ascendancy in the air. Large numbers of British and French airmen were massed in the fighting sector. Every day swarms of them directed the range-finding of the artillery. When the incessant fire began, not a second passed but dozens of enemy aeroplanes flew over our trenches. Great squadrons were sent beyond the German lines to reconnoitre the approach and quartering of our troops, and from time to time drop bombs." . . .

"Generally infantry fighting is preceded by the silencing of the enemy's artillery. This principle was on this occasion transferred to the aerial weapon, which materially increased the effectiveness of the bombardment of our artillery, because artillery without observation from an elevation can accomplish nothing, owing to its indirect fire. The enemy has tested new methods by which airmen can set fire to balloons by pistol shot. This plan is now also adopted by us with very good results."

Mr. W. Beach Thomas, writing to the *Daily Mail* from "the Field," on July 11th, says:—

"One can well understand, though the fact was regrettable, that there was some delay in pushing the attack home. How truly it was said by some of our tacticians at Aldershot as many as five years ago that the next war would be largely fought in woods and villages where there was cover from aerial observation. Among the horrors of the wood was the wreck of one of our aeroplanes."

The *Times* correspondent with the Russian Centre Army, in a despatch dated July 11th, says:—

"German airmen, as usual, are dropping shells on the wounded."

Mr. Philip Gibbs, in a despatch from the British Headquarters in France, dated July 15th, says:—

"With thirty-two prisoners they (Dragoon Guards) rode on slowly, still reconnoitring the open country on the skirt of Delville Wood, until they came again under machine-gun fire and drew back. As they did so an aeroplane came overhead, skimming very low, at no more than 300 ft. above ground. The cavalry turned in their saddles to stare at it for a moment or two, believing that it was a hostile machine. But no bullets came their way, and in another moment it stopped over the German infantry concealed in the wheat and fired at them with a machine-gun. Four times it circled and stooped, and fired, creating another panic among the enemy, and then flew off, leaving the cavalry full of admiration for this daring feat."

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BRITISH AIR WORK.

THE following third *résumé* of incidents extracted from recent reports of the Royal Flying Corps in France has been received from the Air Board:—

"June 17th.—Capt. A., while flying in the vicinity of Arras, observed six hostile machines in close formation flying west, and, following these, three more. As Capt. A. approached them from underneath the formation broke up, and simultaneously two other of our machines attacked from above. Capt. A. engaged the nearest machine, which immediately turned and dived, whilst a second machine attacked him from above. Disregarding this second machine he turned in pursuit of the first one, and after a considerable amount of manœuvring he got behind its tail and fired into it at thirty yards range. The hostile machine continued to dive almost vertically with its engine still on, and was finally seen to plunge to earth in a field near Achiet le Grand. On his return journey Capt. A. attacked two other machines and forced both to descend, though in each case they appeared to land under control.

"June 23rd.—Three eight-horse wagons were attacked by one of our machines from a height of 900 ft. and were stampeded.

"June 25th —As twenty-three hostile kite balloons were reported to be up, it was decided to attack them by aeroplanes at four p.m. Fifteen balloons were attacked, of which six were destroyed. Three more were brought down in flames on June 26th.

"June 27th.—Captain B. successfully carried out a special reconnaissance to observe the effect of wire-cutting operations in front of Gommecourt Wood. In carrying out this duty he descended to 500 ft. to obtain the necessary information.

"June 29th.—One of our machines was attacked by three hostile aeroplanes, which suddenly appeared out of a cloud. The pilot was wounded in the back and lost consciousness, but his observer, climbing out of his seat, roused him, and the pilot landed his machine safely in his own aerodrome. The observer made use of his wireless during the descent to summon a doctor.

"July 1.—Important and successful bombing raids against the enemy's lines of communication were carried out during the day. Several trains were hit and many serious fires occasioned. A bombing raid was launched against a hostile headquarters and a suspected ammunition dump, as a result of which a fire was occasioned at the headquarters which burned for several hours. One pilot failed to release his bombs at the first attempt, and although his engine was running badly and he was continuously being attacked by two hostile aeroplanes, the pilot made two more circles over his objective, released the bombs at the third attempt, and recrossed the lines at 2,500 ft. The attack was repeated later in the day; one bomb fell on the railway, cutting it completely, whilst another destroyed a house. The railways were bombed in many places, several stations are known to have been hit, and in one case a train was hit in the middle and set on fire; this is confirmed by another pilot, who, seeing a train on fire, descended to a low altitude and dropped two more bombs on the rear of the burning train.

"In the early morning hostile attempts at offensive action were attempted by the enemy on our side of the lines, but subsequently this was confined entirely to their side of the lines. No fewer than thirty-five aerial combats took place, in which five hostile machines were brought down on the enemy side of the line, and at least five others were driven down, of which two were seen to be damaged. Another enemy machine was brought down by anti-aircraft fire.

"In one of these combats Major C. single-handed attacked four of the hostile aeroplanes, and it is reported by the anti-aircraft guns that before doing this he completely broke up the German formation of ten aeroplanes and scattered it in all directions. The first machine he attacked was hit between the pilot and the observer and returned to its aerodrome; the second was hit and managed to land in its own lines under control; whilst attacking the third Major C. was hit in the leg, but continued firing until within ten yards. At that range he saw the enemy observer was firing wildly and had evidently been hit. In spite of his wound Major C. proceeded to chase the fourth machine, but was forced to break off the fight owing to his ammunition running out.

"July 2.—There were eleven combats in the air, in which four hostile machines were brought down.

"July 3rd.—The activity of the enemy in the air increased to a very great degree, but it was confined to localities well behind his own lines. Our machines working near the lines were subjected to continuous anti-aircraft fire. There were thirty combats in the air.

"One of our reconnoitring patrols was followed by two Fokkers and a biplane; our escorting machines, having accompanied the reconnaissance back to our lines, turned to engage the enemy, who had by this time been joined by two more Fokkers. One Fokker was shot down and seen to fall to earth, whilst the biplane was forced to descend. Another of our aeroplanes encountered five hostile machines; four were driven off with but little trouble, and though the fifth engaged in combat it was, however, last seen diving vertically with its engine full on, and is believed to have been destroyed."

The following incidents are extracted from recent reports relating to the Royal Naval Air Service.

"Flanders.—June 3rd.—A German battery opened fire on a kite balloon just as it was about to ascend, the first shell bursting within fifteen yards of the basket containing the observers. The cable was immediately cut and the balloon dragged by the crew at the double for three-quarters of a mile, shells following them all the way. The kite balloon was not seriously damaged.

"June 18th.—A seaplane was forced to descend, owing to the engine catching fire, into the middle of an enemy mine-field. A hostile aeroplane and two seaplanes attacked it with machine guns, but were driven off by our fire. Our seaplane was uninjured, and ultimately drifted on the tide towards Nieuport, where the crew were safely rescued.

"Eastern Mediterranean.—May 2nd.—A hostile aeroplane appeared over Mudros, and was driven off by anti-aircraft guns. Within six minutes of its appearance over Mudros our machines from Imbros were in the air with the object of intercepting the enemy's retreat. A seaplane 'spotting' for a monitor resulted in three direct hits being obtained on a railway bridge at Aga Suluk.'

Personals

UNDER the above heading will be published weekly particulars of a personal character relating to those who have fallen or have been wounded in the country's service, announcements of marriages and other items concerning members of the Flying Services and others well known in the world of aviation. We shall be pleased to receive for publication properly authenticated particulars suitable for this column.

Casualties.

Second Lieutenant FREDERICK COOPER ARNAUD, Northumberland Fusiliers, killed on July 1st, in his 20th year, was the youngest son of Mr. and Mrs. Arnaud, Fritzoe, Holwood Road, Bromley, Kent. He was educated at Quernmore School, Bromley, and Merchant Taylors' School, and on leaving joined the staff of Messrs. T. Cook and Son. He joined the Royal Flying Corps as a mechanic in May, 1915, proceeding to the front a month later as a despatch rider. After being recommended for a commission he trained at General Headquarters, and in February this year was gazetted, and soon afterwards attached to a trench mortar battery.

Lieutenant GEOFFREY F. BRIGGS, Gloucestershire Regiment, killed on July 12th, aged 19, was the youngest son of the late Mr. and Mrs. William Briggs, of Bristol, and a brother of Squadron Commander E. F. Briggs, who was shot down in the raid on the Zeppelin factory at Fredrichshafen in November, 1914, and has since been interned in Bavaria. Lieutenant Briggs was educated at Braidlea, Stoke Bishop, and at Clifton College. In February of last year he was given his commission, and he had been promoted Lieutenant (Temporary) quite recently.

Second Lieutenant GEOFFREY ELLIS CHANCELLOR, the Queen's, attached R.F.C. (killed in action on July 9th), was the son of the late Mr. Walter Chancellor, of Hersham, Surrey, and Mrs. Chancellor, of The Manor House, Marylebone Road, London. Born in 1897, he was educated at Eton, and insisted on leaving school at seventeen, obtaining his commission before he was eighteen years old. His chivalry and fearlessness endeared him to his brother officers in the Flying Corps.

Second Lieutenant ANDREW JOHN TUKE CRUICKSHANK, R.G.A., attached R.F.C., who died on July 7th from wounds received in an air reconnaissance on the same day, was born in 1897, and was the youngest son of Mr. G. E. Cruickshank, of Lincoln's Inn, and Mrs. G. E. Cruickshank, 6, Blakesley Avenue, Ealing. He was educated at Mr. Stott's, Seabrook Lodge, Hythe, and at Marlborough, where he was in Field House. From Marlborough he passed into Woolwich in December, 1914, and while there was promoted to the rank of corporal. He received his commission in July, 1915, and left for the front about six weeks ago. He was an Observer in an aeroplane which was attacked by three German machines. Early in the fight he received a wound which made him unconscious, and it was only by great skill on the part of the pilot that the aeroplane was brought back to our lines. An elder brother, Second Lieutenant Donald Edward Cruickshank, who was born in November, 1887, was in the front line of the attack on Sanna-i-Yat on April 9th, and has not been heard of since.

Major GEORGE JOHN MALCOLM, Royal Artillery, attached R.F.C., killed in action, was 25 years of age, and the only son of Mr. George Malcolm, Sokoto, Northern Nigeria, and of Mrs. Malcolm, of Perham Road, West Kensington, and grandson of the late General Sir George Malcolm. He was educated at Dean Close School, Cheltenham, and obtained the Diploma of the College and the B.Sc. University of London, 1911. From the Officers Training Corps he passed out of Woolwich into the Royal Field Artillery in December, 1911, and in June, 1914, he was appointed to the Royal Flying Corps. He was mentioned in despatches by Viscount French on February 18th, 1915, was promoted Captain in the following June, and became a Squadron-Commander with the rank of Temporary Major in March of this year.

Flight Sub-Lieutenant VICTOR NICHOLSON, R.N., killed on July 10th, was the youngest son of the late Mr. W. S. Nicholson, of Eastmore, Isle of Wight, and of Mrs. Nicholson of Grove House, Yarmouth, Isle of Wight.

Second Lieutenant JAMES H. PARKINSON, Lincolnshire Regiment, killed in action, was 30 years of age, and was the son of Mr. and Mrs. Walter H. Parkinson. He joined the Royal Flying Corps after the outbreak of war, and in January last received his commission in the Lincolnshire Regiment. Lieutenant Parkinson was educated at St. Cyprian's School, Eastbourne, and Dulwich College. Going to Ceylon he became superintendent of the Koravantavalan Estate, Travancore, India, in the employ of Messrs. Harrison and Crosfield (Ltd.).

Second Lieutenant J. C. M. STEWART, R.F.C., eldest son of Dr. and Mrs. J. Stewart, Lovell House, Leeds, served his apprenticeship with Messrs. J. and J. McLaren, engineers, Leeds, and was afterwards engaged on experimental work in the laboratory of the Wolseley Tool and Motor Car Co. (Ltd.). A director of Noel Paton (Ltd.), he was forming at the outbreak of war a company for the development of his invention of a four-speed chain gearbox for motor cycles. Lieutenant Stewart joined the Leeds "Pals" Battalion, and in March, 1915, obtained a commission in the Leeds Rifles. He was transferred to the Royal Flying Corps, and became a qualified Observer. On returning from a bombing expedition over the German lines, a chance long-distance shell destroyed the machine when about to land and killed the occupants.

Second Lieutenant RALPH CYRIL STODDARD, R.F.C., attached South Lancs. Regiment, who was previously reported missing, is now reported to have been killed on July 3rd in combat with two hostile machines. He was the only son of the Headmaster of the Heanor Secondary School, Derbyshire, and was 21 years old. Before receiving his commission in October, 1914, he was training for the law, serving his articles with Messrs. Wilson and Sons, solicitors, Alfreton. He passed the Intermediate Law Examination at the early age of 16½. His Squadron-Commander writes:—"He was engaged with two hostile machines over the enemy lines, and was seen by another machine, which went to his assistance, to fall from several thousand feet in a spinning nose-dive. His machine lies in the enemy's lines, and is so crumpled that none thinks there can be any hope of either him or his Observer being alive. I cannot tell you how great a loss he is to the squadron. He was exceedingly keen and as brave as a lion. Only two days ago he kept on worrying me to let him go bombing, and eventually I let him take a load of bombs to drop on hostile batteries which were worrying our infantry."

Second Lieutenant GODFREY WIGLESWORTH, R.F.C., who was killed at the front in a flying accident on July 8th, aged 21, was the only son of Dr. and Mrs. Wiglesworth, of Winscombe, Somerset, formerly of Rainhill, Lancashire. He was educated at The Leas, Hoylake, at Clifton, and at King's College, Cambridge, where he was pursuing medical studies at the outbreak of war. He was a member of the Cambridge University O.T.C., and received his commission in the Royal Flying Corps last December, but had only recently gone to the front.

Married and to be Married.

An engagement is announced between Mr. CHRISTOPHER LLEWELLYN BULLOCK, Indian Civil Service, the Rifle Brigade (Special Reserve), and R.F.C., grandson of the late Rev. W. T. Bullock, of Faulkbourne Hall, Essex, and Mr. E. R. Spearman, C.M.G., and Lady Maria Spearman, and BARBARA MAY, second daughter of Mr. Henry Lupton, of Torquay.

Captain HENRY HAMILTON KITCHENER, Royal Engineers, attached R.F.C., was last week married in London to Miss ESTHER BLUCK. Captain Kitchener was younger nephew of the late Earl Kitchener, and son of the late Lieutenant-General Sir Walter Kitchener. Before his death Sir Walter Kitchener was Governor of Bermuda, and the wedding of his son is an outcome of that appointment, as the bride belongs to Bermuda. He stands in remainder to the later titles conferred upon Lord Kitchener, who left him a legacy of £20,000, as well as the reversion to Broome Park in the event of Viscount Broome having no children.

The engagement is announced of DONNA ORTENSIA NUNZIANTE DI MIGNANO, younger daughter of the late Duca di Mignano, of the Castello di Mignano, Provincia di Caserta, Italy, and of the Duchessa di Mignano, and Mr. CHARLES FRANCIS PIERCY, R.F.A., attached R.F.C., only son of Mr. Robert Charles Piercy, of Marchwiel Hall, Wrexham, and of the Contessa Alliata Vaglienti Campiglia di Biserno.

Items.

The will of Second Lieutenant WILLIAM NORMAN THOMAS, R.F.C., of Oswestry, contractor, who was killed in France, April 8th, has been proved at £2,832.

AIRCRAFT FOR NAVAL WORK.

IN a speech at Brockenhurst on Saturday in support of a resolution of congratulation to the Admiralty and the officers and men of the Fleet on the Jutland battle, Lord Montagu of Beaulieu made several points in connection with the use of aircraft in connection with naval work. He said that the results of the battle were not all that could be wished, because they desired complete, final, and overwhelming victory, which might possibly have been achieved if we had possessed more aircraft. Since the battle he had talked with many naval men who believed in aircraft, and all admitted, and many were enthusiastically certain, that if we had had rigid airships as eyes to the Fleet, the German fleet would never have been able to retreat as it did at the moment that it did. It had been assumed that Zeppelins would be of no great value in a naval battle. During this battle he had ascertained that five Zeppelins had been reported by our Fleet in 24 hours. We had no air scouts at all, and only one seaplane, operating on our side, though that was of great value.

The lack of airships to assist the Fleet was due not only, as some people thought, to Mr. Winston Churchill, who, no doubt, during the last few months of his *regime* at the Admiralty did nothing to assist, but to a long period before, in which the value of airships to the Navy was largely discounted, and the whole question of aircraft was "crabbed." There was no settled policy for a long time. Orders to build airships were cancelled almost before the sheds in which to build them had been erected, but he thought it fair to say that Mr. Churchill had had the candour and courage to admit that he was wrong.

In his opinion, in the future more than half of the work of the Navy would be done in the air. There was no doubt that an airship was the equal of at least three cruisers from a scouting point of view, and even more destroyers. At 10,000 ft., providing visibility was good, a Zeppelin could see 80 or 90 miles, while the range from the foremast of a cruiser would probably not exceed 12 or 15. He thought the Naval Air Service was going to be the most absolutely necessary part of the senior service. He should like every Commander-in-Chief of a big fleet to have on the bridge a senior flying officer who could use aircraft to the best advantage. He was certain it would be cheaper, from the point of view of losses in material and personnel, and more efficient for aircraft to do most of the scouting, providing it was not heavy weather, than for the work to be done by cruisers and destroyers, and he hoped to see that view universally adopted. Sir John Jellicoe, he added, was most desirous of having more aircraft.

Speaking of the work of the Royal Flying Corps in the recent advance, Lord Montagu said the pilots were splendid and courageous officers, and their skill and courage combined had brought most fruitful results to our arms. Those who criticised the department as he had done were no more criticising the pilots than one would criticise the gallant crew of an unseaworthy ship. The machines at the front were very much better than they were three months ago, and the result had been that we had nearly swept the sky bare of the much-advertised Fokker. As time went on, that improvement would not only be maintained but accelerated. In a few months from now the comparative supremacy which we had regained would be firmly established. The longer the war went on, the more would the excellence of our machines, coupled with the gallantry of our pilots, establish our Air Service as superior to any other.

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Neck-wear for Air Work.

To those who take a pride in their personal appearance, but find difficulty when working about an aeroplane to keep their collar clean, Linaline collars come as a veritable godsend. They are not to be confounded with rubber or celluloid collars, for they are ordinary good class cotton goods, but impregnated with a special substance which enables any dirt which may get on them to be washed off with plain soap and water. To all appearance they are linen collars fresh from the laundry, and all that is necessary to keep them so is an occasional visit to the tap or a rub with a damp cloth, and then dry with the towel. They are perfectly waterproof, and consequently rain has no effect on them. They can be obtained from most hosiers, &c., but you should see that you do get "Linaline" collars.

For Three-Ply Birch and Ash.

THOSE firms who have been experiencing considerable difficulty in obtaining supplies of three-ply ash or birch boards for wing ribs and other purposes will be interested to hear that Messrs. Brown Brothers of Great Eastern Street, E.C., have made arrangements whereby they can guarantee prompt delivery. The thicknesses vary from $\frac{3}{32}$ in. to $\frac{1}{4}$ in., and the size of the boards from 6 ft. by 2 ft. to 6 ft. by 2 ft. 6 ins. All boards are A.I.D. passed, and also to R.A.F. specifications (61A and 83). Samples will be supplied on application.

Learning to Fly.

IN their latest book Messrs. Claude Grahame-White and Harry Harper have collaborated to produce what they describe as a "manual for beginners." They have assumed that it will go into the hands of those who know very little of aviation but who want to get an idea of the actual business of learning to fly. They have accomplished their task admirably, and we can hardly imagine that anyone who purchases the book will grudge the expense. It describes in simple language the various stages of a pupil's tuition, and by means of the photographs, which have been specially taken at Hendon, there should be no difficulty in following the description of how the various controls are manipulated. There are other chapters in the book which the prospective pupil would do well to thoroughly digest, such as "Temperament and the Airman," "Factors that make for Safety," "Perils of the Air." "A study of the methods of great pilots," &c. The book is published by T. Werner Laurie, and can be obtained from "FLIGHT" office for 2s. 10d. post free.

"Heat Treatment of Steel."

ALTHOUGH it is not very bulky, the book bearing the above title, which has just been issued by Messrs. G. P. Wall, of Magneto Works, Sheffield, will be found of very great value by aeroplane manufacturers. Not only does it contain a wealth of information on the treatment of steel, with a tempering chart, in colour, but there is a very comprehensive series of tables of gauge comparisons, metric equivalents, and other data. In fact, we do not think there is any other handy publication which contains such complete data relating to steel. Since the inception of the aeroplane industry, the firm have specialised in steel and steel wire to meet the requirements of aircraft work, and so are in a position to render valuable assistance to aeroplane manufacturers. Messrs. G. P. Wall will be pleased to send a copy of the book, which is bound in cloth, to any aeroplane manufacturer, who applies for one.

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PUBLICATIONS RECEIVED.

Trade as a Science. By Ernest J. P. Benn. London: Jarrold and Sons. Price 2s. 6d. net.

Badges and Their Meaning. London: George Philip and Son, Ltd., 32, Fleet Street. Price 1s. net.

Heat Treatment of Steel, Gauge Comparisons, Metric Equivalents, &c. By G. P. Wall, Steel and Wire Manufacturers, Magneto Works, Sheffield.

National Physical Laboratory Report for the Year 1915-16. Teddington: The National Physical Laboratory.

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NEW COMPANIES REGISTERED.

Aerolite Piston Co., Ltd., Hanover Court Garage, Hanover Street, W.—Capital £500, in £1 shares. Under agreement with Bentley and Bentley, Ltd., for the acquisition of the business of manufacturers and sellers of aluminium pistons and castings for use in connection with aeroplane and other internal-combustion engines, &c. A. H. M. J. Ward signs as "Director."

Robinhood Engineering Works, Ltd., Newlands, Putney Vale, Surrey.—Capital £10,000, in £1 shares. Manufacturers of and dealers in sparking plugs and other ignition apparatus for use in internal-combustion engines, general engineers, &c. Under agreement with K. E. L. Guinness.

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Aeronautical Patents Published.

Applied for in 1915.

Published July 13th, 1916.

12,443. W. M. WEBBER. Airships.

Published July 20th, 1916.

17,556. G. GIEM. Safety appliance for flying machines.

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